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Contents

Wood-waste studies....81
Chemicals and Allied Products....83
Paints, Varnishes and Lacquers....83
Miscellaneous Chemicals....83
Electrical Machinery....84
Electronics....84
Generators, Motors, Transmission....86
Miscellaneous....86
Food and Kindred Products....87
Fuels and Lubricants....88
Highways and Bridges....89
Instruments....90
Lumber and Wood Products....91
Machinery....92
Medical Research and Practice....93
Metals and Metal Products....96
Minerals and Mineral Products....97
Packing and Packaging....98
Paper and Allied Products....98
Personnel Aptitude Testing....98
Physics....98
General....98
Nuclear....98
Psychology....99
Structural Engineering....100
Textiles and Textile Products....103
Transportation Equipment....104
Aeronautics....104
Aircraft....104
Instruments....112
Engines and Propellers....113
Land Transportation....116
Marine Transportation....116
Miscellaneous....116
List of Informal Bibliographies....118
Catalog of OSRD Reports....120
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UNITED STATES DEPARTMENT OF COMMERCE

Charles Sawyer, Secretary

OFFICE OF TECHNICAL SERVICES

John C. Green, Director

Comm-DC 15796

March 1952

WOOD-WASTE STUDIES BY THE ENGINEERING EXPERIMENT STATION AT THE UNIVERSITY OF NEW HAMPSHIRE

The Engineering Experiment Station of the University of New Hampshire was established as a Department of the College of Technology in 1932. The Station provides engineering and research facilities for the industries of the State and for various agencies of the state government. The personnel and facilities of the University are available through this agency to manufacturers for the solution of technical problems.

One of the resources of the State of New Hampshire is wood. The Station has directed efforts toward the subject of the utilization of wood, particularly as it applies to the portion usually called "waste."

A great deal of information was gathered concerning plastics, particularly wood plastics, in the early days of our research. U. S. Patent No. 2,381,205 entitled, "Molding Powder and Method of Making Same" by R. A. Caughey assigned to the State of New Hampshire, was issued covering one such plastic. Information with regard to this patent may be secured from the Research Corporation, New York City. The earliest publication by the Station on the subject of wood plastics was published as "Utilization of Lignin by Zinc Salt Treatment" by J. Seiberlich, Reprinted from January, 1945 issue of Chemical Industries.

Concurrent with these early chemical investigations studies were made with regard to the burning of wood, sawdust, etc. "Production of Wood Gas as a Domestic Fuel," Preliminary Report by R. A. Caughey, June 12, 1942 covered the design of a conversion unit wood burner. This design was later more completely developed by the Agricultural Experiment Station and Yale University at New Haven, Connecticut. The Station has recently prepared material (not yet published) covering some aspects of burning hogged wood waste.

After this phase the interest in utilization of wood waste turned more toward possible uses of the constituents of the wood. These studies are exemplified by publications as follows: "Fundamentals of Lignin Chemistry as Applied to Fertilizers," by J. Seiberlich, presented at the Quarterly Meeting of the Northeastern Wood Utilization Council at Orono, Maine, June 29, 1945 and "Project for Utilization of Lignin - An Industrial Waste Product, " by Dr. Stuart Dunn, Dr. Joseph Seiberlich and Dr. D. S. Eppelsheimer, presented at the Quarterly Meeting of the Northeastern Wood Utilization Council at Orono, Maine, June 29, 1945 (out of print). The former discusses the basic types of common lignins and indicates the chemical arrangements of the molecules. The latter indicates the results of a project in which lignin was used as a fertilizer material. Additional work along this line resulted in Engineering Publication No. 3 entitled, "Uses of Lignin in Agriculture," by Stuart Dunn and Joseph Seiberlich, reprinted from Mechanical Engineering, March, 1947 (out of print). This publication is more or less a summary of collected information and research results to that date.

About this time it was brought to our attention that the Sulphite Pulp Manufacturers' Research League, Inc. was doing considerable work in wood yeast research. Thorough studies were conducted which resulted in

Technical Bulletin 88 entitled, "Wood Yeast Protein as a Feed for Livestock" by E. G. Ritzman of the Agricultural Experiment Station, and "Wood Yeast as a Feed for Livestock," by E. G. Ritzman, Engineering Publication No. 7, August, 1948. The latter publication gives the complete results of a thorough study of six digestion and metabolism experiments with lactating cows. In the experiments, both the complete intake of protein and energy as food, and the output as milk and waste matter in urine, feces, and gases of fermentation were measured. The object of the experiments was to compare the value in milk production of wood yeast and soybean meal as high-protein supplements towards base rations low in protein. Nitrogen balances showed an essentially identical utilization for milk and body gains from the two rations. No effect was observed on the milk yield nor on the butterfat content in the change from yeast to soybean meal or from soybean meal to yeast. The results of these experiments were confirmed by feeding wood yeast and soybean meal to cows in a commercially producing herd. This is reported in "Wood Yeast as a Protein Supplement," by E. G. Ritzman, reprinted from Guernsey Breeders' Journal, November 15, 1948 (out of print).

Because of the excellent results in the use of such yeast in cattle feeding, experiments were undertaken to determine the value of such yeast in poultry feeding. This work is reported in "Nutritive Properties of Torula Yeast for Poultry," by R. C. Ringrose, Engineering Publication No. 8, Reprinted from Poultry Science, March, 1949. It was concluded from the experiments reported therein that Torula yeast could be used as a source of protein for growing chicks and laying pullets and it was indicated that there were other values to be obtained by such yeast feeding. These laboratory experiments have been reported in "Experiments on the Value of Wood Yeast Torula Utilis as an Aquatic Fertilizer," by C. F. Jackson, Engineering Publication No. 10, Reprinted from Vol. 79 Trans. American Fisheries Society, August, 1950. It should be pointed out that the work reported in this publication indicates that the wood yeast was not being used as a fish food but rather as a fertilizer of the foods consumed by the fish.

The work in wood waste utilization is now progressing at a somewhat lower rate than in the past. Presently studies are being pursued to determine the results to be expected when using wood yeast as an aquatic fertilizer in outdoor ponds. The Sulphite Pulp Manufacturers' Research League, Inc. has cooperated in providing funds for making 4 outdoor ponds. Experiments have been conducted for a year thus using the yeast in the ponds stocked with various types of fish. It is planned to continue these experiments for an indefinite period.

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Research Associate Professor
University of New Hampshire
Engineering Experiment Station
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CHEMICAL AND ALLIED PRODUCTS

Paints, Varnishes and Lacquers

HIGH TEMPERATURE RESISTANT INSULATING VARNISH. QUARTERLY REPORT NO. 3 ON SIGNAL CORPS CONTRACT NO. W36-039-SC-36866, PERIOD 1 JAN 1949 TO 1 APR 1949, by Lee T. Smith and E. Armstrong. Vita-Var Corporation, Newark, N. J. Apr 1949. 35p tables Microfilm $2.25, Photostat $5.00. PB 105851

1. Varnishes, High temperature resistant 2. Insulating varnishes - Research.

Dept. of the Army project: 3-93-00-500. Signal Corps project: 2005. For other reports on this contract see PB 105670, 104128, 105671, 105852.

HIGH TEMPERATURE RESISTANT INSULATING VARNISH. QUARTERLY REPORT NO. 5 ON SIGNAL CORPS CONTRACT NO. W36-039-SC-36866, PERIOD 1 JULY to 1 OCT 1949, by Lee T. Smith and E. Armstrong. Vita-Var Corporation, Newark, N. J. Oct 1949. 27p tables Microfilm $2.00, Photostat $3.75. PB 105852

1. Varnishes, High temperature resistant 2. Insulating varnishes - Research.

Dept. of the Army project: 3-93-00-500. Signal Corps project: 2005. For other reports on this contract see PB 105670, 104128, 105851, 105671.

Miscellaneous Chemicals

HYDROPHOBIC MONOLAYERS ADSORBED FROM AQUEOUS SOLUTIONS, by Elaine Shafrin and W. A. Zisman. U. S. Naval Research Laboratory. Apr 1941. 23p drawings, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.75. PB 105685

Experimental methods are described for the preparation and examination of hydrophobic monomolecular films adsorbed and isolated from aqueous solutions of certain types of polar-nonpolar organic compounds. The use of contact angle measurements for the quantitative characterization of the hydrophobic and oleophobic properties of such films permits the evaluation of the various factors governing their formation, structure, and repellency characteristics. This interim report presents the results of studies on several members of a homologous family of primary amines of the normal-alkyl type adsorbed onto platinum surfaces. NRL C-3439.

MITTEILUNGEN AUS DEM INSTITUT FÜR ORGANISCHE CHEMIE, VII (REPORTS FROM THE INSTITUTE FOR ORGANIC CHEMISTRY, VII), by Erik Larsson. Chalmers University of Technology, Gothenburg, Sweden. 1951. 30p tables (Text in German) Microfilm $2.00, Photostat $3.75. PB 106005

1. Silanes - Preparation - Sweden 2. Valeric acid, α,δ-Thiodi - Preparation - Sweden 3. Silicon compounds - Organic - Dipole moments - Sweden 4. Acetic acid, [2-(triethylmethylsilyl) ethylmercapto] - Preparation - Sweden 5. Silane, Allyltriethyl - Additives - Sweden 6. Silane, Triethylvinyl - Additives - Sweden 7. Hydrobromic acid - Effect on silane compounds 8. Chalmers University of Technology, Gothenburg, Sweden. Institute for Organic Chemistry. Mitteilungen VII 9. Chalmers University of Technology, Gothenburg, Sweden. Transactions no. 115.

Avd.Kemi och kemisk teknologi 25. Contents: Ueber δ-sulfiddivaleriansäure und ihr oxydationsprodukte (δ-Sulfide-divaleric acid and its oxidation products). - Über einige acetoxy-silane (Some acetoxysilanes). - Über die dipolmomente einiger silizium-organische verbindungen (Dipole moments of some organic silicon compounds). - Ueber [β-triäthylsilyläthyl]-sulfid-essigsäure (Acetic acid sulfide, β-triethylsilyl-ethyl). - Über die addition von bromwasserstoff an die doppelbindungen in triäthyl-vinyl-und triäthyl-allyl-silan (The addition of hydrogen bromide to the double bond in triethylvinyl- and triethylallyl silanes).

MITTEILUNGEN AUS DEM INSTITUT FÜR ORGANISCHE CHEMIE VIII (REPORTS FROM THE INSTITUTE FOR ORGANIC CHEMISTRY VII), by Erik Larsson. Chalmers University of Technology, Gothenburg, Sweden. Mar 1951. 17p (Text in German) Microfilm $1.75, Photostat $2.50. PB 105980

1. Peroxydisulfates - Sweden 2. Kinetic reactions - Sweden 3. Fatty acids - Oxidation - Sweden 4. Chalmers University of Technology, Gothenburg, Sweden. Institute for Organic Chemistry. Mitteilungen VIII 5. Chalmers University of Technology, Gothenburg, Sweden. Mitteilungen no. 121.

Avd. Kemi och kemisk teknologi 26. Includes list of publications of the Institute, 1936-1951. Contents: Notiz über die darstellung von α-alkyl-pimelinsäuren (Note on preparation of α-alkyl-pimelic acid) by Erik Larsson and Ernst van Gilse van der Pals. - Kinetische untersuchungen über die oxydation einiger sulfiddifettsaureionen mit persulfat in alkalischer wasserlösung (Kinetic research on oxidation of some sulfide fatty acid ions with persulphate in alkaline water solutions) by Erik Larsson.

PREPARATION OF METALLIC ARYLSTEARATES, by L. W. Beck, F. S. Cluthe, and J. K. Wolfe. U. S. Naval Research Laboratory. Jan 1946. 11p table Microfilm $1.75, Photostat $2.50. PB 105918

This report concerns the preparation of various salts of arylstearic acids of especial interest in connection with work at this Laboratory on rust inhibitors for use in oils. After preliminary experiments, it was found that reaction of a metal oxide with an arylstearic acid in refluxing xylene was a general method for preparing the metal arylstearates. By this procedure a series of arylstearates has been prepared. In order to evaluate this method of preparation two arylstearates prepared from metal isopropoxides in isopropyl alcohol have been included in the study. The products from both methods appear to be equally pure, although the use of metal oxide results in better conversions. While aluminum phenylstearate was not made available through the general procedure utilizing aluminum oxide, it has been prepared by means of aluminum isopropoxide and phenylstearic acid in xylene solution. Titanium phenylstearate could not be prepared satisfactorily. Purification of the crude products is complicated by

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their amorphous structure and non-volatility. The most efficient method discovered for the purification process consists of exhaustive extractions with either acetone or ethanol. NRL P-2787.

REPORT OF SYMPOSIUM IV: CHEMISTRY AND PHYSICS OF RADIATION DOSIMETRY. PT. I: UNCLASSIFIED PAPERS. CONDUCTED BY TECHNICAL COMMAND, 18, 19 AND 20 SEP 1950 AT ARMY CHEMICAL CENTER, MD. U. S. Chemical Corps. Technical Command, Army Chemical Center, Md. 1951. 187p photos, drawings, diagrs, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $4.75. PB 105925

1. Radiation - Chemical effects 2. Radiation - Dosage determination 3. Radiological defense 4. Crystals - Thermoluminescence 5. Dosimeters 6. Ionization - Density 7. Instruments, Radiation detection 8. Phosphors.

Contents: no. 1. Review of the chemical effects of ionizing radiation, by S. C. Lind. - no. 2. Mechanism of radiation chemical reactions in organic and aquo-organic systems, by Milton Burton. - no. 3. Solvent activated radiation reactions in aqueous solutions, by Hugo Fricke. - no. 4. Theory of radiation chemistry. I: Some effects of variation in ionization density, by John L. Magee. - no. 5. Crystal chemistry of defective structures with respect to radiation, by W. A. Weyl. - no. 6. Luminescent solids (phosphors) by H. W. Leverenz. - no. 7. Effect of radiation on colloidal and high polymeric substances, by Malcolm Dole. - no. 8. Thermoluminescence and related properties of crystals, by Farrington Daniels. - no. 9. The U.C.L.A. dosimeter, its recent modifications and additional applications, by George V. Taplin, Clayton Douglas and Butler Sanchez.

STUDIES ON THE PRODUCTION OF STRONG PHOSPHORIC ACID ACCORDING TO THE WET ANHYDRITE PROCESS, by Sven Nordengren. 1951. 11p tables Microfilm $1.75, Photostat $2.50. PB 106023

A process for making strong phosphoric acid by the wet method, in which the calcium sulphate formed is separated as $CaSo_4$, anhydrite. In order to obtain easily filterable crystals a large quantity of phosphoric acid should be circulated in the process. If the proper temperatures are maintained, stable crystals are formed. The acid contains about 45% P_2O_5 and the yield is 96–97%. Also published as Ingeniörsvetenskapsakademiens Handlingar nr. 206. Chemistry including metallurgy series, vol. 2 nr. 9. Acta polytechnica 90.

SYNTHESIS OF BRANCHED CHAIN FATTY ACIDS AND THEIR METALLIC SALTS, by L. W. Beck, F. S. Cluthe, and J. K. Wolfe. U. S. Naval Research Laboratory. Jan 1946. 18p Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.50. PB 105686

In connection with an extensive program of research on rust inhibitors, a series of branched chain aliphatic acids and their salts has been prepared. The starting materials for these syntheses are four branched chain aliphatic alcohols commercially available in adequate quantity. The alcohols were converted to the corresponding bromide derivatives and these, in turn, were used to alkylate sodiomalonic ester. The substituted malonic esters, without isolation, were hydrolyzed and decarboxylated to a series of aliphatic monocarboxylic acids. Finally, the magnesium and calcium salts of each of the acids were prepared. NRL P 2785.

ELECTRICAL MACHINERY, EQUIPMENT AND SUPPLIES

Electronics

ADDENDUM TO FINAL REPORT, CONTRACT W36-039-SC-38138, FOR PERIOD MAR 1, 1950 TO JUN 1, 1950, by E. S. Stengel. Sylvania Electric Products, Inc., Emporium, Pa. Jun 1950. 5p tables Microfilm $1.25, Photostat $1.25. PB 105837

1. SD 1119 (Electron tube) 2. SD 1119A (Electron tube) 3. Tubes, Electron - Life tests 4. Vacuum tubes, Miniature - Life tests 5. SIG Contract W36-039-sc-38138 Final report, Addendum.

ANALYSIS OF SOME PULSED RADAR TRACK-WHILE-SCAN SYSTEMS, by Stephen J. O'Neil. U. S. Air Force. Electronics Research Division, Cambridge Research Center, Cambridge, Mass. Oct 1951. 32p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105825

A method of determining the maximum expected prediction error in range or azimuth and the optimum radar scan rate during tracking-while-scanning is developed, starting with the probability that a radar signal, from a target aircraft being tracked during scanning, will exceed a given threshold level and be a usable signal in a future-position computer. The method is applicable to maneuvering airplanes of all types and to all pulsed-radar tracking systems either with or without provision for improvement of signal-to-noise ratio by integration. AAF ERL E 5080.

ELECTRON DIFFUSION IN A SPHERICAL CAVITY, by A. D. MacDonald and Sanborn C. Brown. Massachusetts Institute of Technology. Research Laboratory of Electronics, Cambridge, Mass. Aug 1949. 7p diagr, graphs Microfilm $1.25, Photostat $1.25. PB 105831

The diffusion equation for electrons in a nonuniform field is solved and the breakdown condition derived. The breakdown condition is expressed in such a manner that an effective characteristic diffusion length Λ_e is determined; the meaning of Λ_e expresses the equivalent characteristic diffusion length for uniform electric fields. From the experimental breakdown fields, Λ_e is determined and used to predict theoretical breakdown curves which are compared with experiment. Dept. of the Army project no. 3-99-10-022. Signal Corps project no. 102B. MIT RLE TR 134.

ELECTRON TUBES, MINIATURE 6.3 VOLTS AND 26.5 HEATER-CATHODE TYPE REACTANCE MODULATOR. FINAL REPORT FOR PERIOD JULY 1,

1948 TO JAN 31, 1950 UNDER CONTRACT W36-039-SC-38138, by E. Stengel. Sylvania Electric Products, Inc., Emporium, Pa. Feb 1950. 86p photos, drawings (part fold), diagrs, graphs Microfilm $3.75, Photostat $11.25. PB 105837

The principle objective of this project, after modification, was design a pentode reactance modulator capable of producing a frequency shift of ± 50 kilocycles with a distortion of less than 1%. To obtain this objective, a tube with a very linear mutual conductance versus control grid voltage characteristic over a range large enough to produce the required frequency shift, had to be designed. Many test lots of tubes were run to obtain, and to improve upon, the linearity of the mutual conductance versus grid bias characteristic curve. Several different approaches to the problem were investigated. A tube was developed which exhibited the desired linearity, reaching a reported 0.5% with the use of two reactance tubes, and 1.5% with linear mutual conductance versus control grid bias characteristic than has heretofore existed, consequently desirable characteristics for reactance modulator use. Dept. of the Army project: 3-19-02-021. Signal Corps project: 312A-1.

ELECTROSTATIC-TUBE STORAGE SYSTEM, by A. J. Lephakis. Massachusetts Institute of Technology. Research Laboratory of Electronics, Cambridge, Mass. Mar 1950. 44p photos, diagrs (part fold), tables Microfilm $2.50, Photostat $6.25. PB 105836

A storage system which will store binary (ON or OFF) pulses has been constructed, and should prove useful in laboratory studies of certain communication problems. The system comprises two storage channels, each utilizing an M.I.T. electrostatic storage tube, and switching circuits which route incoming pulses into one channel while stored pulses are being recovered from the other. Pulses are stored in each tube in a square array of discrete spots of charge; each spot may assume one of two possible potentials, corresponding to the two possible states of a binary pulse. The order of occurrence of incoming pulses is preserved during storage, but the time relationship is not; the time relationship of pulses recovered from storage is determined by an independent pulse source under control of the user. Consequently, the system may be used to compress, expand, or delay a group of pulses. In order to facilitate testing of the system, special circuits have been provided. The capacity of each storage channel is, at present, 256 pulses. The system operates reliably at all frequencies up to 33 kc/sec when storing incoming pulses, and up to 70 kc/sec when supplying stored pulses. Dept. of the Army project no. 3-99-10-022. Signal Corps project no. 102B. SIG Contract W36-039-sc-32037. MIT RLE TR 154.

FABRICATION AND OPERATING CHARACTERISTICS OF SINTERED THORIA CATHODES, by Seymour Goldberg. Massachusetts Institute of Electronics. Research Laboratory of Electronics, Cambridge, Mass. Jan 1950. 20p drawings, diagrs, graphs Microfilm $1.75, Photostat $2.50. PB 105833

Sintered thoria cathodes, 3 inches long and 0.860 inch in diameter, have been prepared by subjecting a mixture of thoria and tungsten or molybdenum powder to 115 tons/inch^2 pressure, and then sintering the resulting compact at 1750°C for one-half hour. The use of a split-segment die as developed by Raytheon seems to be best for the process. A volume concentration of conducting powder to thoria exceeding 0.212 is required to make the sintered cathode conducting and capable of being heated directly. The operating characteristics of two cathode mixtures, one containing 30 percent tungsten and 70 percent thoria and the other 18 percent molybdenum and 82 percent thoria (by weight), were investigated. The cathode resistivity was found to decrease markedly as the cathode was first brought up to temperature, but once the highest operating temperature was reached no further appreciable decreases occurred. Considerable emission may be obtained at temperatures exceeding 1600°C (brightness); however, the cathode may be activated for short periods of time by flashing to a high temperature. In this manner over 1 amp/cm^2 was obtained at 1600°C (brightness). The period of activation was found to be much longer for the molybdenum mixture; it approached 100 hours. The activation time for the tungsten mixture never exceeded 15 hours. Dept. of the Army project: no. 3-99-10-022. Signal Corps project no. 102B. SIG Contract W36-039-sc-32037. MIT RLE TR 147.

INTEGRATING AMPLIFIER FOR THE OSCILLOGRAPHIC RECORDING OF MAGNETIC FLUX, by S. Ekelöf, L. Bengtson, G. Kihlberg and P. Leithammel. Chalmers University of Technology, Gothenburg, Sweden. 1951. 25p photos, diagrs Microfilm $2.00, Photostat $3.75. PB 105979

1. Magnetic flux - Sweden 2. Amplifiers, Integrating - Design - Sweden 3. Chalmers University of Technology, Gothenburg, Sweden. Transactions no. 120.

Avd. Elektroteknik 28.

MESURES STATISTIQUES DE L' IMPEDANCE H. F. CHARGEANT LES ISOLATEURS HAUTE TENSION DES POSTES DE TRANSFORMATION ET DE COUPLAGE (STATIC MEASUREMENTS OF HIGH FREQUENCY IMPEDANCE ON H. F. INSULATORS OF TRANSFORMER AND DISTRIBUTION STATIONS). TRANSLATED by F. Rizzo. Swiss Electrotechnical Committee. Jul 1951. 26p diagrs, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105840

1. Impedance - Measurements - Switzerland 2. Insulators, High frequency - Switzerland 3. International Special Committee on Radioelectric Disturbances 4. NAVSHIPS T434.

Report submitted by the Swiss Electrotechnical Committee to the International Special Committee on Radioelectric Disturbances.

METAL-CLAD, PROGRESSIVE-PHASE, DIELECTRIC ANTENNAS, by Walter Rotman. U. S. Air Force. Electronics Research Division. Antenna Laboratory, Cambridge Research Center, Cambridge, Mass. Nov 1951. 41p drawings, diagrs, graphs Microfilm $2.50, Photostat $6.25. PB 106113

The metal-clad, progressive-phase, dielectric antenna consists of a rectangular polyrod with only one surface exposed to radiation, the other surfaces being covered by metal plates. Its properties, including theoretical derivations for the phase velocity of the

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transmission mode and radiation characteristics, are derived. The relation between this antenna and other progressive-phase types--such as corrugated antennas and helixes--is brought out. AAF ERL E 5081.

PROGRESS REPORT, JULY-SEPTEMBER, 1951. National Research Council of Canada. Radio and Electrical Engineering Division. Oct 1951. 35p photos, diagrs, graph Microfilm $2.25, Photostat $5.00. PB 105949

1. Radiophysics - Canada 2. Engineering, Electrical - Canada 3. Radar - Canada 4. Electronics - Canada 5. Navigational aids - Canada 6. NRCC ERA 214.

Limited supply available free from National Research Council of Canada, Ottawa, Canada.

RADIO DIRECTION-FINDING AND NAVIGATIONAL AIDS, SOME REPORTS ON GERMAN WORK ISSUED IN 1944-45. Gt. Brit. Dept. of Scientific and Industrial Research. 1951. 98p diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.90. PB 105763

1. Radio waves - Measurements - Germany 2. Radio direction finding - Wave lengths - Germany 3. Radio direction finders - Equipment - Germany 4. Navigational aids - Germany 5. Komet (German radio installation) 6. Hyperbolic functions - Germany 7. DSIR Rad R SR 21.

Papers forming this report are translations of certain German reports captured in 1945. Contents: Paper no. 1. Fundamental problems of direction-finding and range-finding (distance measurement), by Paul von Handel. - Paper no. 2. Considerations on the physical limits for the possible methods of navigation with ground waves, by Wolfgang Pfister. - Paper no. 3. Receiving and direction-finding installations with beamed characteristic (sector D/F installations), by Hermann Jannsen. - Paper no. 4. Possibilities and limitations of direction-finding with sky waves, by Wilhelm Crone. - Paper no. 5. Results of measurements made on the 2-base "Komet" installation at Ismaning, by R. Weber. - Paper no. 6. Radio navigation by the short-wave transit time method, by W. Dieminger. - Paper no. 7. Transit time difference measurements with sky waves, by Andreas Mattes. - Paper no. 8. Measurements on long and very long waves, by Fritz Vilbig. - Paper no. 9. The accuracy attainable in long-range navigation with very long waves and short waves, employing the hyperbolic and distance-measuring methods, by G. Dessauer and Dr. W. Crone.

RIDGE AND CORRUGATED ANTENNA STUDIES. FINAL REPORT, SRI PROJECT 199, COVERING PERIOD 1 JUL 1949 TO 31 DEC 1950, PREPARED by A. S. Dunbar, W. S. Lucke, E.M.T. Jones, and W. K. Reynolds. Stanford Research Institute, Stanford, Calif. Jan 1951. 79p diagrs, graphs Microfilm $3.50, Photostat $10.00. PB 105916

A description is given of a theoretical and experimental investigation of methods for the utilization of corrugated metal surfaces for the propagation and radiation of electromagnetic waves. The various methods for the excitation of the corrugated-surface antennas are described and discussed. The theory of the annular-ring corrugated surface, is presented in detail. A qualitative comparison of the corrugated-surface antenna with other types of end-fire antennas, which include the dielectric-slab or dielectric-rod antennas, long-slot radiators, and linear arrays, is given. Dept. of the Army project no. 3-99-05-022. Signal Corps project no. 22-122B-O. SIG Contract W36-039-sc-44524. SRI project 199, Final report.

UBER DIE ABBILDUNGSFEHLER MAGNETISCHER ABLENKFELDER (IMAGE DISTORTION OF MAGNETIC DEFLECTION FIELDS), by Georg Wendt. Feb 1938. 101p photos, diagrs, graphs (Text in German and English) Microfilm $4.50, Photostat $13.75. PB 105903

The image distortions and aberrations caused by magnetic deflection fields in cathode-ray tubes were studied theoretically. After discussing rotational-symmetrical electron lens systems, a theory is developed for establishing the refraction component for magnetic deflection systems on the basis of Euler-Lagrange equations of motion. Power series for three components of the magnetic vector potential of a symmetrical deflection system are developed permitting the calculation of the aberrations for a given magnetic field. The magnetic deflection fields are said not to cause the spherical type of abberration or anisotropic coma distortion. Thesis-Technische Hochschule, Berlin.

Generators, Motors, Transmission Distribution, and Allied Equipment

STATIC FREQUENCY TRANSFORMERS FOR SMALL ELECTRIC MOTORS, by F. Dahlgren and A. K. Littke-Persson. 1951. 28p diagrs, graphs, table Microfilm $2.00, Photostat $3.75. PB 106021

An experimental study, including certain theoretical considerations, of the possibilities of operating single-phase asynchronous motors by means of static frequency transformers. The investigation deals, firstly, with frequency-doubler circuits using combinations of transductors and dry cell valves, and secondly, with frequency tripler circuits using three-phase transformers with saturated core and secondary winding induced by the zero-sequence flux component. For the second alternative the results are given in the form of per-unit figures of the utilization of the iron cores. Also published as Kungl. Tekniska Hogskolans Handlingar nr. 47. Electrical engineering series vol. 3, nr. 6. Acta polytechnica 82.

Miscellaneous

FOURIER TRANSFORMS IN THE THEORY OF INHOMOGENEOUS TRANSMISSION LINES, by Folke Bolinder. 1951. 84p graphs, tables Microfilm $3.75, Photostat $11.25. PB 106022

Fourier Transforms have been used n ai new approximate treatment of inhomogeneous transmission lines. The analogy between this theory and the aerial and pulse theories is pointed out and discussed. A number of different types of non-uniform lines have

been examined and compared and some examples of the analysis of arbitrary lines have been calculated. These various examples indicate the general flexibility of the method. Three main types of step lines have been throughly examined. Finally a natural law equivalent to the uncertainty relation of Heisenberg is indicated and it is shown that this law governs the problem of Broad Banding. Also published as Kungl. Tekniska Högskolans Handlingar nr. 48. Electrical engineering series vol. 3, nr. 12. Acta polytechnica 88.

TWIN-CHANNEL ELECTRONIC SWITCH, by B. E. Bourne. National Research Council of Canada. Radio and Electrical Engineering Division. Sep 1951. 7p photos, diagr Available from National Research Council of Canada, Ottawa, Canada. $.10. PB 105819

A twin-channel electronic switch is described for use with a single-beam oscilloscope. Two transient or steady-state audio frequencies having components up to 20 kilocycles per second can be observed at the same time by switching the sweep vertically at a rate which is variable up to 10^5 times per second and sampling the audio frequencies in turn. In appearance the result is two horizontal sweeps with separate signal inputs to each. NRCC 2529. NRCC ERA 202.

FOOD AND KINDRED PRODUCTS

BROWNING REACTION. REPORT NO. 18 UNDER CONTRACT DA11-009-QM-1355, COVERING PERIOD OCT 1, 1950-OCT 1, 1951, by Charles D. Hurd and Charles M. Buess. U. S. Quartermaster Food and Container Institute. 1951. 6p Microfilm $1.25, Photostat $1.25. PB 105956

1. Food - Analysis - Browning 2. Northwestern University. Dept. of Chemistry.

Project no. 7-84-17-012. Previous reports under Contract W11-183-qm-8144.

EFFECT OF DEHYDRATION ON THE HISTOLOGICAL AND HISTOCHEMICAL CHARACTERISTICS OF MEAT. REPORT NO. 5 UNDER CONTRACT NO. DA11-009-QM-410, COVERING PERIOD AUG 1, 1950-JULY 31, 1951, by H. R. Kraybill, H. Wang and Ellen Rasch. U. S. Quartermaster Food and Container Institute. 1951. 55p photos, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105953

1. Meat - Dehydration 2. American Meat Institute Foundation, Chicago, Ill.

Project no. 7-84-06-026.

FACTORS AFFECTING HEAT RESISTANCE OF SPORES OF CLOSTRIDIUM BOTULINIUM. REPORT NO. 15 UNDER CONTRACT DA11-009-qm-1395, COVERING PERIOD 1 OCT 1950-30 SEP 1951, by G. M. Dack and Hiroshi Sugiyama. U. S. Quartermaster Food and Container Institute. 1951. 2p Microfilm $1.25, Photostat $1.25. PB 105957

1. Clostridium botulinum 2. Bacteria - Spores - Heat resistance 3. Chicago. University. Division of Biological Sciences. Food Research Institute.

Project no. 7-84-17-012. Earlier reports under Contract W11-183-qm-8122.

FISHERIES PROGRAMS IN JAPAN, 1945-51, COMPILED by William C. Neville. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 54p photos, maps, graphs, tables Microfilm $2.75, Photostat $7.50. PB 106124

1. Fishing industry - Japan 2. Fisheries - Japan 3. SCAP NRS 152.

FRACTIONATION-CRYSTALLIZATION OF BUTTERFAT FOR PRODUCTION OF A SPREAD, BY K. G. WECKEL AND JOLYON A. STEIN. REPORT NO. 4 UNDER CONTRACT NO. DA11-009-QM-390. U. S. Quartermaster Food and Container Institute. Jan 1951. 11p diagr, tables Microfilm $1.75, Photostat $2.50. PB 105968

1. Butter fats - Crystallization 2. Dairy products 3. Wisconsin. University, College of Agriculture. Dairy and Food Industries Dept. 4. QMC FCI Contract DA11-009-qm-309, Report no. 4.

Project no. 7-84-06-029.

JAPAN'S FRESH-WATER FISHERIES, by Donald I. McKernan. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 44p photos, graphs, table Microfilm $2.50, Photostat $6.25. PB 106119

1. Fisheries - Japan 2. SCAP NRS PS68.

MECHANISMS OF CHEMICAL CHANGES AFFECTING THE ACCEPTABILITY OF BEVERAGE MILK PRODUCTS. REPORT NO. 23 UNDER CONTRACT NO. DA11-009-QM-1357, FOR PERIOD 1 SEP 1950-31 AUG 1951, by D. V. Josephson, F. J. Doan, S. Patton, J. T. Hutton, E. F. Price. U. S. Quartermaster Food and Container Institute. 1951. 5p Microfilm $1.25, Photostat $1.25. PB 105954

1. Milk products - Deterioration 2. Milk, Dehydrated - Deterioration 3. Beverages, Milk - Chemical properties 4. Pennsylvania State College, State College, Pa.

Project no. 7-84-06-029.

POWER AND FUEL IN THE MALTING INDUSTRY. Gt. Brit. Ministry of Fuel and Power. 1951. 23p photos, drawings, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.35. PB 105997

1. Brewing industries - Fuel - Gt. Brit. 2. MFP FEB 52.

S. O. Code no. 41-123-52.

ROLE OF PECTIN IN DEHYDRATED FOODS, BY GEORGE L. BAKER, DONALD R. BRADLEY AND RUDOLPH S. WILSHER. REPORT NO. 11 UNDER CONTRACT NO. DA-11-009-QM-327, FOR PERIOD COVERING 1 JUL 1950 TO 30 JUN 1951. U. S. Quartermaster Food and Container Institute. Jun 1951. 11p table Microfilm $1.75, Photostat $2.50. PB 105969

1. Food, Dehydrated - Pectin content 2. Delaware.

University. Dept. of Chemistry.
Project no. 7-84-06-028. For earlier report see PB 101825.

SYSTEMATIC LIST OF FISHES OF THE RYUKYU ISLANDS, by Dr. Yoshio Hiyamo. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 48p drawings Microfilm $2.50, Photostat $6.25. PB 106122
1. Fish - Ryukyu Islands 2. SCAP NRS 150.

FUELS AND LUBRICANTS

ANALYSIS OF AN X-RAY ABSORPTION METHOD FOR MEASUREMENT OF HIGH GAS TEMPERATURES, by Ruth N. Weltmann and Perry W. Kuhns. U. S. National Advisory Committee for Aeronautics. Dec 1951. 35p photos, diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105820
An analysis is presented of an X-ray absorption method for determining high gas temperatures. The indicated temperature represents the mean density of the gas. Correction factors for dissociation and air-gas mixture are calculated as a function of temperature for stoichiometric mixtures of hydrocarbons and air. Design suggestions for a practical instrument are given on the basis of a theoretical analysis, which is corroborated by a few experimental data. NACA TN 2580.

ANNUAL REPORT OF RESEARCH AND TECHNOLOGIC WORK ON COAL, FISCAL YEAR 1950, by Arno C. Fieldner and Sidney Gottley. U. S. Bureau of Mines. Nov 1951. 118p photos, diagrs, graphs, tables Microfilm $4.75, Photostat $15.00. Limited supply available free from U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa. PB 105906
1. Coal - Research 2. BM IC 7618.

EXCHANGE OF WATER BETWEEN HYDROPHOBIC LIQUIDS AND AIR, by J. A. Krynitsky and H. W. Carhart. U. S. Naval Research Laboratory. Dec 1951. 19p drawings, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50. PB 106127
Investigations of the exchange of water between air streams and hydrophobic-type liquids, such as the hydrocarbon fuels, have shown that such liquids at fixed temperatures, on exposure to air of given relative humidity, exchange water rapidly with the air to reach a final equilibrium content. This equilibrium content is the same regardless of the initial water content of the liquid. For an ideal exchange, the equilibrium water content is equal to the product of the solubility of the water in the liquid and the relative humidity of the air. The rate of exchange is exponential in character and the experimental results follow closely the results calculated from the theoretical equations derived. NRL R 3874.

OLEOPHOBIC FILMS ADSORBED FROM OIL SOLUTIONS, by W. A. Zisman. U. S. Naval Research Laboratory. Anacostia Station, Washington, D. C. Nov 1943. 56p photo, diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105917
This is an account of research work carried on at this Laboratory in order to better understand and utilize the ability of polar compounds to adsorb on solids from solutions in non-polar organic liquids. By a systematic application of new experimental techniques, and by employing properly selected homologous series of organic additives of exceptional purity, it is shown that a large number of polar organic compounds possess the property of giving rise to monomolecular films adsorbed from solution on the surfaces of many clean metallic and non-metallic solids. One new class of films having a number of important properties has been discovered. These films are not wetted by oils, i.e., are "oleophobic", and also possess the property of being highly "hydrophobic" (as unwetted by water as are paraffins). The films of some types of organic compounds are shown to be more readily adsorbed from solutions than are others. Two classes of oleophobic films are distinguished. The films reversibly lose their oleophobic property if the temperature rises above a certain value characteristic of the adsorbed compound and the concentration of the solution. Finally, it is shown that such films form the most protective of the adsorbed monomolecular films. The fundamental causes of these adsorption phenomena are outlined. The connections between these new results and certain practical applications are indicated. These relate to: (1) Increasing the "oiliness" property of an oil and testing for it; (2) Developing the best possible anti-corrosion additives for oils; (3) Treating surfaces with a dry monolayer to prevent wetting by oils; (4) Treating surfaces with a dry monolayer to prevent corrosion by water or vapor; (5) The lubrication of "super finished" metals; (6) The avoidance in naval practice of gears and machinery not wetted by oils. Date of tests: Mar 28, 1942-Jun 1, 1943. NRL P 2206.

PROPERTIES OF COLORADO OIL SHALE, by K. E. Stanfield, I. C. Frost, W. S. McAuley and H. N. Smith. U. S. Bureau of Mines. Nov 1951. 36p photos, graphs Microfilm $2.25, Photostat $5.00. Limited supply available from U. S. Bureau of Mines, 4800 Forbes Ave., Pittsburgh, 13, Pa. PB 105948
1. Oil shales - Properties 2. BM RI 4825.

RATE OF EVAPORATION OF A KEROSINE SPRAY, by W. Sacks. Canada. National Aeronautical Establishment. 1951. 18p drawings, graph, tables Microfilm $1.75, Photostat $2.50. PB 105914
The evaporation of a kerosine spray at 22°C. has been measured by gravimetric analysis of an air stream passing through the spray developed by a miniature pressure-jet atomizer at 50 and 80 p.s.i. fuel pressure. Calculations have been made of the evaporation rate for the same conditions based on equations derived by Hopkins and by Probert from the Rosin-Rammler distribution law. Evaporation constants for kerosine were obtained from the Langmuir equation for the evaporation of a droplet. The measured values indicated an evaporation rate of 0.2 - 0.4 percent per second while the calculated values were 100 times greater. This difference is attributed mainly to the inaccuracy of the simple Langmuir expression when applied to a collection of

droplets. Published in July 1950 as Report MF-2816 of Division of Mechanical Engineering, National Research Council. NAEC N7.

REIN HYDRODYNAMISCH GESCHMIERTE GLEITLAGER MEHR-GLEITFLÄCHENLAGER (MULTIPLE FRICTION SURFACE BEARING, LUBRICATED PURELY HYDRODYNAMICALLY). TRANSLATED BY PROF. FRITJOF A. RAVEN, EDITED BY MARGARET W. RAVEN, by Wilhelm Frössel. Sep 1951. 11p diagrs, graph Microfilm $1.75, Photostat $2.50. PB 105842

Boundary cases of friction bearing lubrication are boundary lubrication and hydrodynamic lubrication. In actually fabricated bearings it is in most cases a matter of mixed lubrication. Flow conditions in the parallel and in the excentric lubrication clearance are treated. Pressure curve over the arc of the clearance and the pressure field of the lubrication clearance are discussed also. Optimum clearance conditions on the basis of the laws of hydrodynamic flow according to the theory of Reynolds and Sommerfield. Impossibility of achievement in the cylindrical friction bearing at small and smallest bearing plays. Solution by use of the multiple friction surface bearing. Advantages and designed examples. Bericht no. 116 des Maschinenauschusses des Vereins Deutscher Eisenhüttenleute. Translated from Stahl und Eisen, vol. 71, no. 3, Feb 1951, p. 125-128. STS 120. NAVSHIPS T436.

SOME OBSERVATIONS ON DIFFUSION FLAMES AT LOW PRESSURES, by F. H. Holderness. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Aug 1946. 6p drawings, graph, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.40. PB 105774

A description is given of some observations on the flames from wick lamps and candles burning in a stream of air in a chamber which can be gradually exhausted. The effects of scale, temperature, and of the chemical nature of the fuel on the pressure at which extinction occurs is examined. S. O. Code no. 23-2445. Cover date is 1951. ARC RM 2445.

SUPPORT AT ROADHEADS. Gt. Brit. Ministry of Fuel and Power. South Wales Advisory Committees on Falls of Ground. 1951. 15p diagrs, drawings Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.15. PB 105764

1. Mines and mining - Supports - South Wales
2. Coal mines and mining - Supports - South Wales
3. MFP SP 23.

SYNTHESIS AND CHARACTERIZATION OF ESTERS AND ETHERS FOR NONSPREADING LUBRICANTS, by J. G. O'Rear. U. S. Naval Research Laboratory. Dec 1951. 20p tables (1 fold) Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50. PB 106130

Development by this Laboratory of nonspreading lubricants for low-temperature applications has necessitated that a variety of esters and ethers be synthesized and highly purified. Some of these compounds were necessary in elucidating the spreading phenomena involved while others were made in the search for suitable liquid compounds for the development of a number of nonspreading lubricant compositions intended for service. Thirty such compounds have been synthesized, purified, and characterized. The following physical and chemical constants were determined: boiling point, density, refractive index, surface tension, molecular refraction, parachor, and kinematic viscosity. NRL R 3891.

SYNTHETIC LOW TEMPERATURE GREASES FROM ALIPHATIC DIESTERS, by G. M. Hain, D.T. Jones, R. L. Merker, and W. A. Zisman. U. S. Naval Research Laboratory. Feb 1946. 37p drawings, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105915

A series of low temperature greases has been prepared from the aliphatic diesters thickened with lithium stearate and modified by the addition of small quantities of well-defined chemicals. The syntheses and properties of these diesters have been described in other publications of this Laboratory. The base fluids used in these greases varied in viscosity from 4.6 to 47.3 centistokes at 100°F, and the freezing and pour points varied from below -100 to -40°F. The resultant greases resemble in texture and working properties the present petroleum base greases specified by Army and Navy Specifications AN-G3a, AXS-637 and OS-1350. However, the evaporation rates normally encountered in low temperature greases have been eliminated without sacrificing any operating characteristics. Using the lower viscosity diesters, greases have been prepared with lower plasticity numbers (a measure of low temperature torque) at -90°F than any other product submitted to the Navy for test. Salt spray corrosion protection with the new greases is not yet quite as satisfactory as for the best greases submitted under Navy Specification OS-1350. However, the protection afforded has been found ample for the lubrication of naval equipment not operated openly exposed to salt water spray. These synthetic greases can be processed in standard equipment. So many urgent military needs were found for these greases that, at the request of both the Bureau of Ordnance and the Bureau of Aeronautics, no extensive mechanical or service simulating testing program was attempted by this Laboratory. Samples were distributed to a large number of naval activities and contractors for testing the equipment in which it was to be used. NRL P-2741.

HIGHWAYS AND BRIDGES

GRITTING MACHINES FOR SURFACE DRESSING, by D. B. Waters and D. S. Wilson. Gt. Brit. Dept. of Scientific and Industrial Research. Road Research Laboratory, Harmondsworth, England. 1951. 22p photos, drawings, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.40. PB 105996

1. Roads - Surface treatment - Gt. Brit. 2. Road materials - Binding equipment - Gt. Brit. 3. Road repair machinery - Gt. Brit. 4. Machines, Gritting - Gt. Brit. 5. DSIR RRL RN 12.
S. O. Code no. 47-141-12.

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INVESTIGATION OF BRIDGE FOUNDATION CONDITIONS THROUGH BORING AND GEOPHYSICAL METHODS, by William Albert Goodwin. Kentucky. Engineering Experiment Station. Dec 1951. 42p photos, diagrs, graphs Available from Engineering Experiment Station, University of Kentucky, Lexington, Ky. PB 105913

1. Resistance, Electrical - Measurements 2. Bridges - Foundations and piers 3. Geophysics 4. KE EES B22.

University of Kentucky. College of Engineering. Publications, vol. 6, no. 2.

ORIGIN-DESTINATION SURVEYS AND TRAFFIC VOLUME STUDIES, by Robert Emmanuel Barkley. Highway Research Board. Dec 1951. 278p maps, diagrs, graphs, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D.C. $3.00. PB 105971

1. Traffic surveys 2. Traffic surveys - Bibliography 3. HRB B11.

REPORTS OF COMMITTEE ON ROADSIDE DEVELOPMENT (INCLUDING SPECIAL PAPERS) PRESENTED AT THE 30TH ANNUAL MEETING). Highway Research Board. Committee on Roadside Development. 1951. 119p photos, maps, diagrams, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $1.50. PB 105707

1. Roads - Roadside development 2. Roads - Construction 3. Erosion.

STUDIES IN NIGHT VISIBILITY. PRESENTED AT THE 30TH ANNUAL MEETING, 1951. Highway Research Board. Nov 1951. 56p photos, diagrs, graphs, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $.90. PB 105845

Contains four papers. The first, "Factors Affecting the Perception of Relative Motion and Distance Between Vehicles at Night" by Donald R. Hoppe and A. R. Lauer, reports results of a study relating to driver reaction to various conditions of visibility and to the perceptual value of a vehicle being overtaken on the road at night. The second paper, by J. E. Uhlaner and Irving A. Woods is "A Study of the Relationship between Photopic and Scotopic Visual Acuity." Selected charts for the measurement of visual acuity by day (photopic) were administered to 202 soldiers. These men were also tested with the Army Night-Vision Tester R2X for their scotopic acuity. A positive correlation was found between the measures of these two types of visual acuity. "Field and Laboratory Evaluation of Roadside Sign Surfacing Materials" by James H. Havens and Allie C. Peed contains a discussion of the physical and optical characteristics of sign materials and the results of laboratory and field tests on these materials. The fourth paper is a "Filter Study of the Effect of Certain Transmission Filters on Visual Acuity With and Without Glare" by A. R. Lauer. A representative set of 20 filters was tested for the effect on visual acuity. In all cases there was a decrease in visual acuity with the introduction of a filter. HRB B43.

VOLCANIC ASH AND LATERITE SOILS IN HIGHWAY CONSTRUCTION. PRESENTED AT THE THIRTIETH ANNUAL MEETING, 1951. Highway Research Board. Nov 1951. 32p photos, maps, graphs, tables Available from Highway Research Board, National Research Council, 2101 Constitution Ave., N. W., Washington 25, D. C. $.60. PB 105911

1. Roads - Construction 2. Roads - Construction - Hawaii 3. Soil stabilization 4. Soils, Laterite 5. Soils, Volcanic ash 6. Winterkorn Road Research Institute, Princeton, N. J. 7. HRB B44.

Contents: Highway construction problems, involving plastic volcanic ash, by K. B. Hirashima. - Laterite soils and their stabilization, by Hans F. Winterkorn and E. C. Chandrasekharan.

INSTRUMENTS

AUTOMATIC SCANNING AND RECORDING PHOTOMETER FOR NIGHT-SKY STUDIES, by Douglas Marlow and J. C. Pemberton. U. S. Naval Ordnance Test Station, Inyokern, Calif. Jul 1959. 36p photos, fold drawing, diagrs (1 fold) Microfilm $2.25, Photostat $5.00. PB 105961

This paper describes a photoelectric photometer which scans the entire sky in 32 min, recording the light energy in a 100-A band as a function of altitude and azimuth. The light is chopped by a rotating shutter and detected by a photomultiplier tube, the output from which is amplified and synchronously rectified to produce a d-c signal for the graphic recorder. Three different types of automatic scanning are provided, as well as a manual control of the various functions. The minimum energy which may be reliably recorded, using a 4-in., f:1 lens, is of the order of 10^{-13} watts. NOTS 224. NAVORD 1168.

DEVELOPMENT OF AUXILIARY CYCLOTRON EQUIPMENT FOR USING TRITIUM AS BOMBARDING PARTICLES IN A CYCLOTRON, by D. N. Kundu, F. G. Boyle and M. L. Pool. U. S. National Advisory Committee for Aeronautics. Dec 1951. 19p diagrs Microfilm $1.75, Photostat $2.50. PB 105936

A circulating system for radioactive tritium was constructed, assembled, and tested. The results showed that the pumping speed of the system was too low for use. With a sufficiently increased pumping speed, it is believed that the circulating system would provide satisfactory operation. NACA TN 2573.

DIGITAL ELECTRONIC CORRELATOR, by Henry E. Singleton. Massachusetts Institute of Technology. Research Laboratory of Electronics, Cambridge, Mass. Feb 1950. 34p photo, diagrs (1 fold) Microfilm $2.25, Photostat $5.00. PB 105835

The relation between correlation functions and the general theory of communication is presented; this relation leads to a technique for electronic computation of correlation functions and to the design of a machine for carrying out the computation. Because of the requirements of great accuracy and long storage the machine makes use of binary digital techniques for storage, multiplication and integration. Descriptions of the more unusual circuits in

the machine are given, and complete circuit diagrams are included. A number of experimental results obtained by the machine are presented. Dept. of the Army project no. 3-99-10-022. Signal Corps project no. 102B. SIG Contract W36-039-sc-32037. MIT RLE TR 152.

HIGH-SPEED PRODUCT INTEGRATOR, by Alan B. Macnee. Massachusetts Institute of Technology. Research Laboratory of Electronics, Cambridge, Mass. Aug 1949. 22p photos, diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105832

A high-speed product integrator has been developed. A one-hundred-point solution is obtained every 1.67 sec. The solution is displayed on a cathode-ray tube screen. This product integrator is made up of electronic differential analyzer components and a set of motor-driven potentiometers. The evaluation of the solutions of the Fourier, Schlömilch, and superposition integral equations is considered and typical examples are given. An analysis of the principal sources of error has been made and verified experimentally. The errors depend upon the problem. In the worst case observed the error had a maximum value of 10 percent, while for most cases the observed error is of the order of 2 percent. Dept. of the Army project no. 3-99-10-022. Signal Corps project no. 102B. SIG Contract W36-039-sc-32037. MIT RLE TR 136.

STUDIES ON THE THRESHOLD SENSITIVITY OF INFRARED DETECTORS USED IN ROCKETS. PART 2: DESCRIPTION OF THE APPARATUS TO BE FLOWN IN AN AEROBEE ROCKET, by Charles Aiken and William Sloughter. Electro-Mechanical Research, Inc., Ridgefield, Conn. Jul 1951. 29p photos, diagrs, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105983

Equipment developed and constructed under Contract AF 19(122)-98 by Electro-Mechanical Research, of Ridgefield, Connecticut, to measure sky radiation between 0.8 and 2.7 microns. A field of 10^{-10} watt/cm^2 produces a signal equal to the cell noise and an automatic attenuator allows accurate measurements throughout a 10,000:1 range. Internal calibration is provided, and measurements are made sequentially through four windows perpendicular to axis of rocket. Air Force Contract no. AF19(122)-98. AAF ERL E5053-2.

UPPER ATMOSPHERE RESEARCH REPORT NO. XIII: ROCKET-BORNE INSTRUMENTATION FOR IONOSPHERE PROPAGATION EXPERIMENTS, by J. E. Jackson. U. S. Naval Research Laboratory. Jan 1952. 42p photos, diagrs, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $1.25. PB 106131

The rocket-borne equipment used for the ionosphere propagation experiments conducted during V-2 and Viking flights has been developed and improved to the extent that satisfactory operation has been obtained in all recent flights. Various problems were encountered in the development owing to the limitations imposed by the research vehicle and the method of experimentation. Space and weight, as well as freedom from interference with other cooperating agencies, had to be considered. In addition, the equipment had to be physically rugged and electrically stable to operate successfully under the severe conditions of vibration, aerodynamic drag, and temperature changes occurring during flights. The experiments were conducted by transmitting two crystal-controlled c-w radio-frequency signals, one of such frequency as to be substantially affected by the ionosphere and the other of such frequency as to be essentially unaffected. Thus, since the antenna pattern had to be favorable toward the receiving stations on the ground, a diplexing whip antenna having a pattern similar to that of a dipole has replaced the earlier V-2 tail antennas. In recent flights, experiments were begun 80 seconds after take-off at an altitude of approximately 35 miles. Autotune circuits were added to accomplish tuning, i.e., matching between transmitter and antenna impedances, at this time, and a retuning unit was developed to initiate a second tuning at a much higher altitude. Antenna impedances during flight could be determined from the telemetering data of the micromatch circuit and of the matching transformer variable condenser position. The problems connected with ionosphere research instrumentation are no longer considered major sources of difficulty; certain aspects of the antenna problem which still remain to be solved tend to reduce radiation efficiency, but apparently do not introduce serious errors in the propagation data provided that the rocket does not spin or tumble. NRL R3909.

VORGÄNGE AN KRISTALLOBERFLÄCHEN (REACTIONS ON CRYSTAL SURFACES) von I. N. Stranski. Chalmers University of Technology, Gothenburg, Sweden. 1951. 23p photos, diagrs, graphs, table (Text in German) Microfilm $2.00, Photostat $3.75. PB 106004

1. Crystal structures - Sweden 2. Microscopes, Electron - Sweden 3. Hexamethylenetetramine - Crystal structure - Sweden 4. Chalmers University of Technology, Gothenburg, Sweden. Transactions, no. 114.

Vortrag, gehalten an der Chalmers Tekniska Högskola, Göteborg, am 16.6.50.

LUMBER AND WOOD PRODUCTS

BUCKLING OF FLAT PLYWOOD PLATES IN COMPRESSION, SHEAR, OR COMBINED COMPRESSION AND SHEAR: BUCKLING TESTS OF FLAT PLYWOOD PLATES IN COMPRESSION WITH FACE GRAIN 45° TO LOAD -- LOADED EDGES CLAMPED, OTHERS SIMPLY SUPPORTED, by L. A. Ringelstetter. U. S. Forest Products Laboratory, Madison, Wis. Feb 1949. 14p photos, graphs, tables Microfilm $1.75, Photostat $2.50. PB 104382

The critical buckling loads of flat plywood plates with the grain direction at an angle of 45° to the edges and with the plates subjected to edgewise compression with their loaded edges clamped and the remaining edges simply supported were determined. From a plot of the buckling values of 50 such test plates, a curve was developed similar to a curve applying to corresponding plates tested with all edges simply supported. Upon comparison, it was found that

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the new curve developed has values for the abscissas 1.5 times those of the previous curve. This report is one of a series issued in cooperation with the Air Force-Navy-Civil Subcommittee on Aircraft Design Criteria under the supervision of the Aircraft Committee of the Munitions Board. The work here reported was done in cooperation with the U. S. Air Force under order no. (33-038)45-301E. FPL 1316-J.

CHARCOAL PRODUCTION AND USES. Northeastern Wood Utilization Council, Inc., New Haven, Conn. Jan 1952. 94p photos, diagrs, tables Available from Northeastern Wood Utilization Council, Inc., P. O. Box 1577, New Haven 6, Conn. PB 105992

1. Charcoal - Production 2. Charcoal - Briquetting 3. Charcoal - Chemical properties 4. Charcoal - Physical properties 5. Charcoal - Uses 6. Kilns, Beehive 7. Kilns, Charcoal 8. Wood - Carbonization 9. SIFIC process (Wood carbonization) 10. Retorts, Mellman 11. Carbon, Activated - Production 12. NWUC B37.

Contents: Physical and chemical properties of commercial charcoals in relation to industrial use, by C. A. Stokes and Hanna Friedenstein. - Small rectangular charcoal kilns, by Henry W. Hicock. - Charcoal production in steel drums, by Henry I. Baldwin. - Continuous carbonization of wood, SIFIC process, by August Lambiotte. - History and present status of the industry; continuous carbonization, the Mellman retort, by Donald F. Othmer. - Beehive kiln operation, by Donald F. Othmer. - Domestic uses and distribution, by Charles K. Richardson. - Industrial uses, by S. P. Kelly. - Briqueting of charcoal, by Robert S. Aries. - Active carbon, by John W. Hassler.

FORESTRY IN JAPAN 1945-51, by Laurence J. Cummings. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 144p photos, maps, graphs, tables Microfilm $5.75, Photostat $18.75. PB 106125

1. Forestry - Japan 2. SCAP NRS 153.

HARDWOODS FOR BUILDING AND GENERAL PURPOSES. Gt. Brit. Dept. of Scientific and Industrial Research. Forest Products Research Laboratory, Aylesbury, England. 1951. 18p Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.35. PB 105829

1. Wood, Hard - Physical properties - Gt. Brit. 2. Wood, Hard - Uses - Gt. Brit.

S. O. Code no. 47-167.

MACHINERY

ANALYSIS AND DESIGN OF HYDRODYNAMIC GAS BEARINGS, by R. R. Weber. North American Aviation, Inc. Aerophysics Laboratory, Los Angeles, Calif. Sep 1949. 26p drawings, graphs Microfilm $2.00, Photostat $3.75. PB 105756

This report presents the fundamental theory of operation of single-disc pad, and journal types of gas bearing supports from the standpoint of gas consumption and load carrying ability. An attempt has been made to illustrate the optimum or desirable values for the different bearing parameters. Two typical examples, a spherical bearing with four pads and a journal bearing, have been worked out to illustrate the design techniques which were developed. Project MX-770. Report AL-699.

ANALYSIS OF THE FLOW IN THE ROTATING PASSAGE OF LARGE RADIAL-INLET CENTRIFUGAL COMPRESSOR AT A TIP SPEED OF 700 FEET PER SECOND, by Vasily D. Prian and Donald J. Michel. U. S. National Advisory Committee for Aeronautics. Dec 1951. 46p photo, diagrs, graphs, table Microfilm $2.50, Photostat $6.25. PB 105927

An analysis of the flow in the rotating passage of a 48-inch diameter radial-inlet centrifugal impeller at a tip speed of 700 feet per second indicated that a region of low efficiency generally existed along the trailing face as a result of a combination of shifting of low energy air toward the trailing face and losses arising from the decelerations along the trailing face. Because of the comparatively large viscous losses along the trailing face, and with the unloading of the blades, the velocity at the driving face tip was higher than the trailing face tip. This velocity difference would be expected to result in mixing losses upon diffusion of the air. The theoretically predicted eddy on the driving face was not found experimentally. Modification of the theoretical entrance angle of flow for the first 15 percent of the passage gave fair agreement between the theoretical and experimental static pressures at off-design conditions except for the maximum flow conditions. NACA TN 2584.

BERECHNUNG DES SPANNUNGSZUSTANDES UND SCHLUPFES BEIM ROLLEN DEFORMIERBARER KUGELN (CALCULATION OF THE STRESS PATTERN AND SLIP DURING ROLLING OF DEFORMABLE BALL BEARINGS) TRANSLATED BY PROF. F. A. RAVEN, EDITED BY MARGARET W. RAVEN, by G. Sonntag. Sep 1951. 30p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105843

Neglecting the transverse elongation, the slip, work expended in friction, and the stress pattern are investigated for the case dealing with the rolling of deformable spheres. When the adhesion zone proceeds toward zero, we get the maximum for the transmittable tangential force, for which the solution may be considered rigorous, if we use the assumptions and experience supplied by H. Fromm in his study of the rolling of deformable disks. When a finite adhesion zone exists, its shape is rigorously defined and the ascribed loading in connection to the slip and the friction work are determined by two narrow boundaries, so that the approximation may be deemed good. It is proved rigorously that during transmission of a tangential force a sliding zone must always exist. An extension to elliptical pressure areas will be possible without difficulty. Translated from Zeitschrift für angewandte mathematik und mechanik, vol. 30, no. 3, Mar 1950, p. 73-83. STS 112. NAVSHIPS T 437.

CARE OF SMALL PLANT AND HAND TOOLS. Gt. Brit. Ministry of Works. 1951. 4p diagr, drawings Available from British Information Services, 30 Rockefeller Plaza, New York 20, N.Y. $.10. PB 105994

1. Industrial equipment - Maintenance and repair - Gt. Brit. 2. Factories - Maintenance and repair - Gt. Brit. 3. Tools, Hand - Maintenance and repair - Gt. Brit. 4. MOW AL 22.
67-9999.

CORROSION OF BRASS-RETAINER BALL BEARINGS, by Hayward R. Baker. U. S. Naval Research Laboratory. Dec 1951. 10p drawings, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.25.
PB 106132

Difficulty has recently been experienced by bearing manufacturers, maintenance depots, and military laboratories from corrosion of steel balls and races during storage of brass-retainer ball bearings. This corrosion has been duplicated in the laboratory and has been shown to be galvanic in nature. The rate of corrosion is accelerated by small quantities of acids formed by oxidation of a petroleum or diester or by hydrolysis of an aliphatic diester oil. The rust inhibitor, barium mahogany sulfonate, serves to accelerate the rate of corrosion by its presence. This corrosion can be greatly reduced or even prevented by using a corrosion inhibitor capable of neutralizing the acids as they are formed and thus preventing them from accelerating the rate of corrosion between the dissimilar metals. NRL R3918.

DETERMINATION OF RAM-JET COMBUSTION-CHAMBER TEMPERATURES, BY MEANS OF TOTAL-PRESSURE SURVEYS, by I. Irving Pinkel. U. S. National Advisory Committee for Aeronautics. Dec 1951. 12p diagrs, graphs (1 fold), tables Microfilm $1.75, Photostat $2.50. PB 105856

A method is described by which the total temperature of the gases at the combustion-chamber outlet of a ram-jet engine may be determined from the loss in total pressure measured across the combustion chamber. A working chart is presented by means of which the ratio of the total temperature of the gases at the combustion-chamber outlet to the total temperature of the gases at the combustion-chamber inlet may be determined from the measured loss of total pressure across the combustion chamber and the known values of air flow, total pressure, and total temperature at the combustion-chamber inlet. NACA TN 2526.

THREAD CHASERS: USE, CARE AND MAINTENANCE. U. S. Navy Dept. Office of Procurement and Material. Oct 1944. 12p photos, diagrs Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50.
PB 106144

1. Chasers - Maintenance and repair 2. NAVSHIPS IN 22.
Includes supplement 1, 10 Oct 1944.

TOOL HOLDERS (FOR LATHE TOOL BITS). U. S. Navy Dept. Office of Procurement and Material. Sep 1944. 2p diagrs Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.25. PB 106143
1. Lathe tools - Holders 2. NAVSHIPS IN 20.

MEDICAL RESEARCH AND PRACTICE

BIOLOGICAL AND MEDICAL ASPECTS OF IONIZING RADIATION I: THE EFFECT OF X-RADIATION ON THE POTENTIAL DIFFERENCE ACROSS ISOLATED FROG'S SKIN, by Herbert B. Gerstner and Oskar L. Ritter. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Nov 1951. 7p diagrs, graphs Microfilm $1.25, Photostat $1.25.
PB 106038

For living membranes or tissue slides an electrode has been developed which enables the determination of resting potential, electrical impedance, permeability to tracer isotopes, and the simultaneous exposure to ionizing radiation. By means of this electrode, isolated frog's skin was exposed to an intensity of x-rays of 10,000 r per minute. Two main observations were made: first, x-radiation affects the skin potential without delay; second, x-radiation destroys the processes essential for the maintenance of the potential. The technique employed should prove useful in studying the mechanics of tissue damage and the effectiveness of protective agents. AAF SAM Proj. 21-47-005, Report no. 1.

BIOCHEMICAL CHANGES OF THE RAT DURING EXPOSURE TO COLD. II: CHANGES OF ACETYLCHOLINE CONTENT IN THE BRAIN, by Lawrence J. Milch, Harvey F. Midkiff, Priscilla Matthews, Herman I. Chinn. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Aug 1951. 3p table Microfilm $1.25, Photostat $1.25. PB 105849

Certain literature data indicated that acute exposure to cold may increase the concentration of acetylcholine in the mammalian brain. The brains of 30 control rats were excised and base levels of free and total acetylcholine concentrations were determined by the leech method. A similar group of 30 rats was then exposed to -12° C. for two hours and the effect of this treatment on the brain of chilled rats showed significantly increased concentrations of both free and total acetylcholine. AAF SAM Proj. 21-23-027, Report no. 2.

CIRCULATORY ADJUSTMENTS TO REDUCED BAROMETRIC PRESSURE, by Jerome L. Lipin, and William V. Whitehorn. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Dec 1951. 7p graphs, tables Microfilm $1.25, Photostat $1.25.
PB 106034

Anesthetized dogs exposed to 178.7 mm. Hg (35,000 feet simulated altitude) withoxygen inhalation show no significant changes in heart rate, stroke volume, cardiac output, and systolic, diastolic, mean, or pulse pressures. Skin temperatures are significantly reduced, indicating a reduction in peripheral blood flow. The factors responsible for the reduction in peripheral circulation have not been determined, but it is suggested that vasomotor reflexes originating in the distended gastrointestinal tract and accessory air sinuses or as the result of accumulations of extravascular gas in body tissues may be responsible for the effects noted. Reduction in peripheral flow may play a significant

role in the etiology and development of decompression sickness and other effects of reduced barometric pressure. AAF SAM Proj. 21-23-013, Report no. 3.

DEFICIENCY DISEASES IN JAPANESE PRISON CAMPS, BY DEAN A. SMITH AND MICHAEL F. A. WOODRUFF, WITH AN INTRODUCTION, by J. Bennet. Gt. Brit. Medical Research Council. 1951. 222p photo, fold drawing, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.50. PB 105762

1. Diet - Evaluation - Japan 2. Malnutrition - Japan 3. Vision - Dark adaptation - Effect of malnutrition - Japan 4. Granulocytopenia - Japan 5. Extremities - Paralysis, Spastic - Effect of malnutrition - Japan 6. Food rations - Nutritive value - Japan 7. Prisoners - Malnutrition - Japan 8. MRC SR 274.

S. O. code no. 45-8-74. Contents: - Appendix A. Methods devised for utilizing foods and other products of nutritional importance, Civilian Internment Camp, Hong Kong. - Appendix B. Description of photometer for determining the capacity for dark adaptation. - Appendix C. Details and histories of cases of agranulocytosis and spastic paraplegia.

DYNAMICS OF BLOOD FLOW UNDER ABNORMAL PRESSURE. I: ALTERATIONS IN RESPIRATION, SYSTEMIC CIRCULATION, AND PULMONARY CIRCULATION DURING MODERATE HYPOXIA IN THE DOG, by Earl F. Beard, John D. Alexander, Thomas W. Howell, and Kurt R. Reissmann. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Dec 1951. 8p tables Microfilm $1.25, Photostat $1.25. PB 106035

In ten narcotized dogs, fifteen minutes of exposure to a mixture containing 8.5 percent oxygen produced a significant rise in minute volume of respiration due to an increased tidal volume without change in respiratory rate; an increase in cardiac output (by the direct Fick method) due to an increased pulse rate associated with a lowered stroke volume; a rise in femoral systolic and diastolic arterial pressure, but no significant change in pulmonary arterial pressure. Following exposure all variables returned to the control values except respiratory rate (which was less than the control value) and tidal volume (which remained above the control value). AAF SAM Proj. 21-26-003, Report no. 1.

EFFECTS OF LOW ENVIRONMENTAL TEMPERATURE ON NUTRITIONAL REQUIREMENTS. REPORT NO. 7 UNDER CONTRACT NO. DA11-183-QM-1278, COVERING PERIOD JAN 1, 1950-DEC 31, 1950, by B. H. Ershoff, H. B. McWilliams, S. Greenberg, O. J. Golub. U. S. Quartermaster Food and Container Institute. 1951, 3p Microfilm $1.25, Photostat $1.25. PB 105955

1. Cold - Physiological effects 2. Nutrition - Metabolism 3. Thurston, Emory W., Laboratories, Los Angeles, Calif. 4. QMC FCI Contract DA11-183-qm-1278, Report no. 7.

Project no. 7-84-12-011.

EXPLOSIVE DECOMPRESSION. II: MECHANICAL EFFECT OF MULTIPLE EXPLOSIVE DECOMPRESSIONS, by William L. Burkhardt, Charles K. Coulson, Dominic Criscuolo, and Harry F. Adler. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Aug 1951. 9p diagrs, graphs, tables Microfilm $1.25, Photostat $1.25. PB 105847

Studies have been conducted to determine if animals exposed to numerous rapid decompressions were subject to additional hazard. The results on dogs which were decompressed rapidly, seven consecutive times, demonstrated an increase in pulmonary hemorrhages when compared with animals which were decompressed one time. High pulmonary pressures were recorded in the first experiments. Investigation on both animals and humans demonstrated these pressures to be secondary to the restriction of air through the standard compensated expiratory valve incorporated in the A-13 and A-15-A oxygen masks. AAF SAM Proj. 21-23-005, Report no. 2.

MECHANISMS OF HIGH ALTITUDE ADAPTATION. IV: HEMOGLOBIN CATABOLISM DURING AND AFTER PROLONGED EXPOSURE TO HYPOXIA, by Kurt R. Reissmann, Bernhard Hoelscher, Elaine Topka, Dominic Criscuolo, William L. Burkhardt. U. S. Air Force. School of Aviation Medicine, Randolph Field, Texas. Nov 1951. 12p graphs Microfilm $1.75, Photostat $2.50. PB 105846

The hemoglobin catabolism during the development and during the disappearance of polycythemia induced by hypoxia was studied by measuring the total circulating hemoglobin and the daily bile pigment excretion in bile-fistula dogs before, during, and after prolonged periods of exposure to 20,000 feet simulated altitude. The increased erythropoiesis during the first weeks of altitude exposure was accompained by a significant increase in bile pigment output. No differences were observed in the life span of the red blood cells at ground level and during altitude exposure. The normalization of the polycythemia after return to ground level was achieved by the combined effect of a depressed erythropoiesis and an increased blood destruction. The latter accounted for 21 to 39 percent of the hemoglobin which disappeared from circulation after return to ground level. AAF SAM Proj. 21-23-003, Report no. 4.

PROCEDURE FOR RECORDING COCHLEAR MICROPHONICS IN ANIMALS, by Juergen Tonndorf and F. A. Brogan. U. S. Air Force. School of Aviation Medicine. Randolph Field, Texas. Dec 1951. 9p photos, diagr, graphs Microfilm $1.25, Photostat $1.25. PB 106037

A procedure for recording cochlear microphonics in the guinea pig and the rabbit is described. A combination of corrected signal source (stimulation) and power-level recorder (registration) facilitates relatively fast recording of gradient response curves for ten standard frequencies (between 200 and 6000 cycles) The action potentials of the eighth nerve are excluded by a cancellation method. AAF SAM Proj. 21-27-001, Report no. 5.

RADIOLOGICAL HEALTH AND CIVIL DEFENSE (FOURTH NATIONAL PUBLIC HEALTH ENGINEERING CONFERENCE, MARCH 27-30, 1951) Florida. Engineering and Industrial Experiment Station, Gainesville, Fla. Nov 1951. 108p photos, drawings, graphs, tables Available from The Director, Florida Engineering and Industrial Experiment Station, Gainesville, Fla. PB 105855

1. Radiation - Biological effects 2. Radiation - Determination 3. Radiation - Protection 4. Radioisotopes - Metabolism 5. Decontamination 6. Nuclear reactions 7. Biological warfare 8. Chemical warfare 9. National Public Health Engineering Conference, 4th, Gainesville, Fa. 10. F. EES B48.

Engineering progress at the University of Florida, vol. 5, no. 11. Contents: Part 1. Basic principles of radiation: Historical sketch of radiation protection experience and increasing scope of radiation protection problems, by Karl Z. Morgan - Nuclear structure and nuclear reactions, by R. T. Overman. - Units of radiation and radioactivity, by Elda E. Anderson. - Detection of radiations, by R. T. Overman. - Part 2: Radiological health: Biophysics methods of radiation detection, by A. A. Bless. - Some quantitative aspects of naturally occuring radioactivity, by George K. Davis. - Quantitative limits of permissible exposure of personnel, by Karl Z. Morgan. - Basic principles of radiation protection, by Elda E. Anderson. - Internal radiation hazards, by Cyril L. Comar. - Radioisotopes in medicine, by Gould A. Andrews. - Industrial applications of radioactivity, by George G. Manov. - Disposition of radioactive sources, by C. C. Ruchhoft. - Radiological health program, by Edwin G. Williams. - Problems of control and disposal of radioactive waste materials, by Roy J. Morton. - Part 3: Civil defense: Medical aspects of civilian defense against atomic weapons, by George A. Hardie. - Decontamination of radioactive areas, by Francis E. Ray. - Coordination between fire, police, health, welfare, and rescue workers, by W. D. Joiner. - Mutual aid and mobile support, by H. H. Woeltjen. - Defense against biological warfare, by Richard S. Green. - Chemical warfare defense problems, by Harry P. Kramer. - Part 4: Panel discussion.

STUDIES OF HUMAN TOLERANCE FOR EXTREME HEAT. IV: PSYCHOMOTOR PERFORMANCE OF PILOTS AS INDICATED BY A TASK SIMULATING AIRCRAFT INSTRUMENT FLIGHT, by W. V. Blockley and John Lyman. U. S. Air Materiel Command. Engineering Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. May 1951. 50p photos, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105850

A total of fourteen exposures of four experienced pilots to three high temperature environments are described in terms of the time course of performance on a complex pyschomotor task simulating instrument flying. Experiments were conducted at 160°, 200° and 235°F, with humidity approximately 0.8 in. Hg vapor pressure, using a comfortable environment in the neighborhood of 80°F as a control. Subjects were trained in advance of these experiments in the operation of the test apparatus, which consisted of a portable simulated cockpit with standard Link Trainer controls and instruments, and given an initial one-hour practice period on the experimental flight pattern before the first heat exposure. The task consisted of continuous repetitions of this flight pattern, which was four minutes in duration and included four turns combined variously with climbs, dives and level flight. Though differing in level of competency or skill in the task, no subjects showed a change in proficiency within 80 minutes of "flight" in the comfortable environments, but under heat exposure showed marked deterioration of performance in the terminal stages, commencing from four to thirteen minutes prior to the termination of exposure. Heat exposures were terminated in accordance with the criteria of tolerance which have been defined in previous reports and used in all series of experiments in these heat tolerance studies. The amount of deterioration, i.e., the increase in error per four minute cycle of the flight pattern, was greater in the high temperature exposures than at 160°F. At 200° and 235°F the deterioration was markedly greater and began sooner for the two less competent subjects. Hypotheses are developed from the results, and certain evidence from reports of other workers are cited in support of these. Numerous comparisons are possible between these results and those obtained with the same subjects in similar environments performing simple addition and number-checking exercises; several such comparisons are reported. Contract W33-038-ac-14504. AAF TR 6521.

URBAN WORKING-CLASS HOUSEHOLD DIET, 1940 TO 1949. FIRST REPORT OF THE NATIONAL FOOD SURVEY COMMITTEE. Gt. Brit. Ministry of Food. National Food Survey Committee. May 1951. 119p tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.90. PB 105995

1. Diet - Evaluation - Gt. Brit. 2. Food rations - Nutritive value - Gt. Brit. 3. World War, 1939-1945 - Economic aspects.

Norman C. Wright, Chairman, Ministry of Food, and also Chairman, National Food Survey Committee. S. O. code no. 68-3.

USE OF CORTISONE IN THE TREATMENT OF EXPERIMENTAL FROSTBITE, by R. B. Lewis, and Ella Freytag. U. S. Air Force School of Aviation Medicine, Randolph Field, Texas. Aug 1951. 3p. Microfilm $1.25, Photostat $1.25. PB 105848

The extent of muscle and skin necrosis was determined in two series of frostbitten rabbits treated with cortisone and compared to control animals. For the determination of skin necrosis the hind legs of rabbits were exposed to an alcohol bath at -15° C. for 30 minutes and for muscle necrosis to -12° C. for 30 minutes. The treated animals were given 2.5 mg. cortisone intramuscularly twice daily 2 days beginning with the day of exposure and 1.5 mg. twice daily for 5 days at which time the animals were sacrificed. Cortisone in the doses used was not effective in reducing the extent of muscle or skin necrosis after standard cold injuries. AAF SAM Proj. 21-23-006, Report no. 9.

METALS AND METAL PRODUCTS

CERAMIC COATINGS FOR PREVENTION OF CARBON ABSORPTION IN FOUR HEAT-RESISTANT ALLOYS, by Joseph W. Pitts and Dwight G. Moore. U. S. National Advisory Committee for Aeronautics. Dec 1951. 14p photos, graph, tables Microfilm $1.75, Photostat $2.50. PB 105930

Three ceramic coatings were applied to four heat-resistant alloys (three types of 18-8 stainless steel and Inconel) and then tested for their effectiveness in preventing carbon absorption after box carburizing for 4 hours at 1350° to 1650° F. Carbon absorption that occurred on uncoated specimens at these conditions was inhibited by the application of a ceramic coating. The coating apparently seals the surface of the alloy from carburizing gases and thus prevents carbon pickup and resulting precipitation of carbides at or near the grain boundaries. NACA TN 2572.

FUNDAMENTAL EFFECTS OF COLD-WORK ON SOME COBALT-CHROMIUM-NICKEL-IRON BASE CREEP-RESISTANT ALLOYS, by D. N. Frey, J. W. Freeman and A. E. White. U. S. National Advisory Committee for Aeronautics. Jan 1952. 12p graphs, table Microfilm $1.75, Photostat $2.50. PB 105941

The influence of cold-working on creep properties of an alloy containing 20-percent cobalt, 20-percent chromium, 20-percent nickel, and the balance iron and on the same alloy modified by small additions of tungsten alone or tungsten, molybdenum, and columbium in combination was studied. Effects of cold-working on creep resistance were the same for all alloys studied for temperatures up to 1600° F and reductions between 15 and 40 percent. Conclusions were reached by studying creep properties and also internal stress relaxation at test temperatures which previous work had shown to be the controlling factor in response of such alloys to cold-working. NACA TN 2586.

MARFORM, A NEW METAL FORMING PROCESS, PART I. U. S. Bureau of Ships. Nov 1951. 17p photos, drawings Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $.50. PB 105800

1. Metals - Fabrication 2. Tools - Manufacture 3. Guerin process (Tool manufacture) 4. NAVSHIPS IN 116.

Reprint of "A comparative description of the Marform process" by R. Burt Schulze, printed in Light Metal Age, Apr. 1950, and enlarged to include material digested from "Marform, the new metal forming process", by J. V. Bertrand.

MECHANICAL AND CORROSION TESTS OF SPOT-WELDED ALUMINUM ALLOYS, by Fred M. Reinhart, W. F. Hess, R. A. Wyant, F. J. Winsor and R. R. Nash. U. S. National Advisory Committee for Aeronautics. Dec 1951. 74p diagrs, photos, tables Microfilm $3.50, Photostat $10.00. PB 105935

Corrosion behavior of spot-welded aluminum-alloy (alclad 24S-T3, 24S-T3, alclad XB75S-T6, XB75S-T6, and R-301-T6) panels of varying weld quality was determined. Tidewater and weather exposure tests were made and the results were evaluated largely in terms of distribution of corrosion products and effects on weld strength. Metallographic examinations of several of the alloys were also made to determine the extent and type of corrosion attack associated with various welding and exposure conditions. NACA TN 2538.

SELECTED GOVERNMENT RESEARCH REPORTS. VOLUME 9: POWDER METALLURGY. Gt. Brit. Ministry of Supply. 1951. 189p photos, drawings, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $4.25. PB 105758

1. Metallurgy, Powder - Gt. Brit. 2. Metals - Surface testing - Gt. Brit. 3. Metallurgy, Powder - Iron - Gt. Brit. 4. Alloys - Research - Gt. Brit. 5. Metal powders - Sintering - Germany 6. Metal powders, Non-carbide - Germany 7. Ball bearings - Tests - Gt. Brit. 8. Iron powders - Properties - Gt. Brit. 9. Iron powders - Production by electrodeposition - Gt. Brit. 10. Vehicles, Track - Ball bearings - Germany 11. Bands, Driving - Iron - Germany 12. Guns - Bands, Iron - Sintered - Germany 13. Oerlikon (Guns) 14. Metal powders, Iron-copper - Compacts - Gt. Brit. 15. Aluminum alloys - Production by powder metallurgy 16. Titanium - Tensile strength - Gt. Brit. 17. Gt. Brit. Ministry of Aircraft Production 18. Gt. Brit. Dept. of Scientific and Industrial Research. Technical Information and Documents Unit, London, England 19. Gt. Brit. Royal Aircraft Establishment.

S. O. Code no. 51-294-9*. Published for the Technical Information and Documents Unit of the Department of Scientific and Industrial Research. Contents: Report no. 1. Surface energies of metals and alloys, by C. J. Lead beater. (Based on A.R.D. Met. Report, December, 1948). Report no. 2. Examination of sintered metal components, by L. Northcott and C. J. Leadbeater. (Based on A.R.D. Met. Report, August 1944). - Report no. 3. Some properties of engineering iron powders, by C. J. Leadbeater, L. Northcott and F. Hargreaves. (Based on A.R.D. Met. Report, May 1946). (Published by the Iron & Steel Institute in Special Report no. 38, 1947). Appendix to Report no. 3. Determination of specific surface of iron powders by a modification of the air-permeability method, by F. M. Lea. - Report no. 4. Production of iron powder by electrode-position, by G. E. Gardam. (Based on A.R.D. Met. Note, March, 1947). (Published by the Iron and Steel Institute in Special Report no. 38, 1947). -Report no. 5. German sintered iron bearings, by L. Northcott and C. J. Leadbeater. (Based on A.R.D. Met. Report, December, 1945). Appendix to Report no. 5, by the Superintendent, Engineering Division, National Physical Laboratory. - Report no. 6. Trials of sintered iron driving bands for 20mm Oerlikon ammunition, by L. Northcott and B. D. Burns. (Based on A.R.D. Met. Report, June 1943). Report no. 7. Sintered iron-copper compacts, by L. Northcott and C. J. Leadbeater. (Based on A.R.D. Met. Report, March, 1947). (Published by the Iron & Steel Institute in Special Report no. 38, 1947). - Report no. 8. An aluminium alloy made by powder metallurgy, by R. L Bickerdike. (Based on R.A.E. Report) (Published by the Iron and Steel Institute in Special Report no.

38, 1947). - Report no. 9. Notes on German developments in non-carbide powder metallurgy (1939-1945), by C. J. Leadbeater. (Based on A.R.D. Met. Report, March, 1947). (Published by the Iron & Steel Institute in Special Report no. 38, 1947). - Report no. 10. Tensile strength of titanium at various temperatures, by R. L. Bickerdike and D. A. Sutcliffe. (Based on R.A.E. Tech. Note, November, 1948).

STUDY OF SLIP FORMATION IN POLYCRYSTALLINE ALUMINUM, by Aldie E. Johnson, Jr. and S.B. Batdorf. U. S. National Advisory Committee for Aeronautics. Dec 1951. 18p photos, graph, table Microfilm $1.75, Photostat $2.50. PB 105931

Experimental results are presented which shed light on the assumptions that have been made in several attempts to bridge the gap between the physical and mathematical theories of plasticity. The experimental results are compatible with, but do not necessarily verify, the conception that plastic deformation in strain-hardening materials is primarily due to slip. Slip was observed to occur first in a few isolated grains and to spread gradually to adjacent grains as the stress level increased. The occurrence and spread of the slip lines suggested independent behavior of randomly oriented grains at low stress levels with interaction among grains increasing as the stress level increased. NACA TN 2576.

MINERALS AND MINERAL PRODUCTS

CONTRIBUTION TO THE METHODS OF MEASURING THE PLASTICITY OF CLAYS, by R. Ahlberg. Chalmers University of Technology, Gothenburg, Sweden. 1951. 27p diagrs, graphs, table Microfilm $2.00, Photostat $3.75. PB 105978

A method has been elaborated for the determination of the plasticity of ceramic clays, using Hoeppler's consistencio-meter. Two English clays, and clays with pure cation complexes made from them, have been investigated. The plasticity numbers obtained by this method do not correspond to the ATTERBERG-RIEKE numbers, but there is reason to suppose that the former are more correct. Institutionen för Silikatkemisk Forskning 29. Chalmers University of Technology, Gothenburg, Sweden. Transactions no. 119.

GROWING OF SINGLE CRYSTALS OF MAGNETITE, by J. Smiltens. Massachusetts Institute of Technology. Laboratory for Insulation Research, Cambridge, Mass. Dec 1951. 18p photos, drawings, graphs, tables Microfilm $1.75, Photostat $2.50. PB 106039

Large, single crystals of magnetite, 1 cm in diameter and up to 4.3 cm long, of high purity and perfection have been grown from the melt. The density at 20°C is 5.185, i.e., 99.58 percent of the X-ray density. The composition corresponds to stoichiometric Fe_3O_4 within analytical error. Phase diagram considerations, growing procedure, methods of chemical analysis and composition data are discussed. O.N.R. Contract N5ori-07801, NR-074-041. MIT LIR TR 49.

PROPOSED PROGRAM ON BASIC RESEARCH IN EXTRACTIVE METALLURGY OF TITANIUM. REPORT BY TITANIUM-ZIRCONIUM PANEL. National Research Council. Division of Engineering and Industrial Research. Metallurgical Advisory Board. Dec 1951. 32p Microfilm $2.25, Photostat $5.00. PB 105989

A specific program has been formulated for coordinated basic research in extractive metallurgy of titanium. This program is aimed at providing data useful in perfecting and evaluating potential production processes. Information to be derived from this program is urgently needed for furthering advancements in the production of titanium. The general scope of the proposed program is to obtain scientific type data on systems ranging from titanium concentrates through primary or purified metal. Forty-two specific but broad projects are outlined in eight categories of scientific areas of research. Each of these projects is graded with respect to criteria of applicability of data, priority, and magnitude of effort. Objectives and scope for all of the projects selected are briefly described. It is not the intention of this proposed program on basic research in extractive metallurgy of titanium to be all-inclusive or limiting; but it is intended as a framework or guide for starting actual research work. The projects outlined have been carefully chosen from those suggested by producers of titanium and by qualified research workers in the field. As new important titanium recovery processes are revealed, emphasis on the program should be shifted to meet the needs. However, the type of scientific determinations, as outlined in the program, should be applicable to new systems that are not now covered. Report MAB-12-M. SIG Contract DA-49-025-sc-83.

TITANIUM. REPORT OF SYMPOSIUM ON TITANIUM SPONSORED BY OFFICE OF NAVAL RESEARCH, 16 DEC 1948. U. S. Office of Naval Research. Mar 1949. 160p photos, drawings, diagrs, graphs, tables Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C. $.65. PB 106029

1. Titanium 2. Titanium alloys 3. Titanium-nickel alloys 4. Titanium - Physical properties 5. Titanium - Mechanical properties 6. Titanium alloys - Metallurgy 7. Phase diagrams 8. NAVEXOS P-622.

Contents: Welcoming address, by Capt. William H. Leahy. - Introduction, by J. J. Harwood. - Bureau of Aeronautics' titanium program, by N. E. Promisel. - Program of the Air Materiel Command on titanium alloys, by Richard R. Kennedy. - Titanium program of Army Ordnance, by Laurence S. Foster. - Production of titanium powder at Boulder City, by F. S. Wartman. - Fabrication of titanium and investigations of titanium-nickel alloys in the Bureau of Mines laboratories, by J. R. Long. - Physical and mechanical properties of commercially pure titanium, by C. I. Bradford, J. P. Catlin and E. L. Wemple. - Production and properties of iodide titanium, by Bruce W. Gonser. - Properties of iodide type titanium, by F.B. Litton. - Induction melting of titanium metal in graphite, by J. B. Sutton. - Production and arc melting of titanium, by C. T. Greenidge and L. W. Eastwood. - Some preliminary tests to determine applications for titanium, by W. Lee Williams. - Some preliminary data on alloys of titanium, by E. J. Larsen, F. F.

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Swazy, L. S. Busch and R. H. Freyer. - Titanium-base alloys, by Howard C. Cross. - Some aspects of the metallurgy of titanium alloys, by P. H. Brace. - Titanium-base alloys program of the Naval Research Laboratory, by E. J. Chapin. - Carbon-oxygen relationship in titanium melted in carbon refractories, S. F. Urban and A. C. Haskell. - First progress report on titanium-carbon and titanium-nitrogen phase diagrams, by J. P. Nielsen.

ÜBER DAS PROBLEM DER ZERSTÖRUNG ANTIKER GLÄSER. II. MITTEILUNG: ÜBER DIE BELEGUNG VON GLASOBERFLÄCHEN MIT SCHUTZFILMEN (THE PROBLEM OF RESTORING ANTIQUE GLASS, PART II: COVERING THE GLASS SURFACES WITH PROTECTIVE FILM), by J. Arvid Hedvall, Robert Jagitsch and Gillis Olson. Chalmers University of Technology, Gothenburg, Sweden. 1951. 17p photos, diagrs, graph (Text in German) Microfilm $1.75, Photostat $2.50. PB 105977

The decay of ancient glass can be considered as a problem of the action of the gases present in the atmosphere on the glass. It is a question of both chemically active and chemically inert gases, especially carbon dioxide and water vapour. Through adsorption these gases form mono-molecular films on the glass. As ancient glass is generally rich in alkali a leaching process takes place, and finally only a frame-work of silica is left. The destructive process can be stopped by the following method. The glass object is first treated with carbon tetrachloride in order to remove any fatty substances from the surface. The reaction products from the attacks of carbon dioxide and water vapour are then removed by submerging the object in dilute nitric acid (5 pC.). After washing and drying, the object is placed in an evacuating chamber until a vacuum of 10^{-6}mm. Hg is reached. The chamber is then slowly filled with lacquer and equally slowly drained. The glass object will then have acquired a uniform film of lacquer, and is left to dry. The choice of resin as well as of solvent for the lacquer is most important. The lacquer must have a low viscosity even in a concentrated solution in order to fill the pores and capillaries in the glass, and it must be colour-fast and have a suitable refraction index. After investigating a number of substances it was found that polymethyl methacrylate best fullfilled the conditions. Institutionen för silikatkemisk Forskning 28. Summary in English. Chalmers University of Technology, Gothenburg, Sweden. Transactions no. 118.

PACKING AND PACKAGING

BASIC DESIGN DATA FOR THE USE OF FIBERBOARD IN SHIPPING CONTAINERS, BY T. A. CARLSON, K. Q. KELLICUTT, AND E. F. LANDT. REPORT NO. 21 UNDER CONTRACT NO. 49-106-0511-50, FOR PERIOD JUL 1, 1950 TO JUN 30, 1951. U.S. Quartermaster Food and Container Institute. Jun 1951. 3p Microfilm $1.25, Photostat $1.25. PB 105970

1. Containers, Fiber 2. Fiberboard 3. Shipment of goods 4. QMC FCI Contract 49-106-0511-50, Report 21.

Project no. 7-91-03-012.

PAPER AND ALLIED PRODUCTS

BACTERIOLOGICAL STUDIES OF STORED KRAFT PAPER MILL WASTES, BY GEORGE B. BARNES, WILLIAM A. MOGGIO AND ARTHUR A. COLMER. REPORT OF INVESTIGATION CONDUCTED BY THE ENGINEERING EXPERIMENT STATION AND DEPT. OF BOTANY, BACTERIOLOGY AND PLANT PATHOLOGY, LOUISIANA STATE UNIVERSITY. 1950. 44p graphs, tables Available from Engineering Experiment Station Louisiana State University, Baton Rouge, La. PB 105826

1. Wood waste - Bacteriology 2. Stream pollution - Prevention 3. L EES B19.

PERSONNEL APTITUDE TESTING

EVALUATING THE PERFORMANCE OF RESEARCH PERSONNEL, A MANUAL FOR SUPERVISORS. American Institute for Research, Inc., Pittsburgh, Pa. Aug 1951. 50p drawings Microfilm $2.50, Photostat $6.25. PB 104947

1. Efficiency, Industrial 2. Personnel, Research - Efficiency.

PHYSICS

General

SOIL MECHANICS AND PLASTIC ANALYSIS OR LIMIT DESIGN, by D. C. Drucker and W. Prager. Brown University. Graduate Division of Applied Mathematics, Providence, R. I. Nov 1951. 17p diagrs Microfilm $1.75, Photostat $2.50. PB 105824

1. Soil mechanics 2. Plasticity - Theory 3. GDAM A11-64/17 4. GDAM TR 64.

Contract N7onr-35801, T. O. I, NR-041-032.

UNITS & STANDARDS OF MEASUREMENT EMPLOYED AT THE NATIONAL PHYSICAL LABORATORY. I: LENGTH, MASS, TIME, VOLUME, DENSITY AND SPECIFIC GRAVITY, GRAVITY, FORCE AND PRESSURE. Gt. Brit. National Physical Laboratory. 1951. 13p table Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.25. PB 105765

1. Weights and measures - Gt. Brit.

Nuclear

MAXIMUM ALLOWABLE CONCENTRATIONS OF FISSON PRODUCTS IN THE AIR AS A FUNCTION OF EXPOSURE TIME AND TIME AFTER DETONATION: INTERIM REPORT, by Robert L. Harvey. U. S. Chemical Corps. Chemical and Radiological Laboratories. Radiological Division, Army Chemical Center, Md. Nov 1951. 19p graphs, tables Micro-

film $1.75, Photostat $2.50. PB 105760

In this paper, the calculations of Hunter and Ballou (6) were used to furnish individual and total beta activities of fission products at various times between 1 hr. and 1 yr. after detonation. Then the concentration in air necessary to cause the deposition and retention of the maximum permissible amounts (4) of Sr^{90} was calculated for several times after detonation, and for various exposure times. Each of the other fission products considered hazardous was then compared at several times to Sr^{90} on the basis of relative activity, and toxicity. The possibility that "bad actors" might appear as decay products of active material already in the body was considered. Then estimates were made of their radio-toxicity relative to Sr^{90}. This relative value was called the "Sr^{90} equivalent". The concentrations necessary to cause retention of 1 Sr^{90} equivalent at various times were calculated and a graph prepared showing maximum permissible concentrations of fission products from 1 hr. to 1 yr. after detonation for various exposure times. CRLIR 64. Project 4-12-10-002. CC CRL IR 64.

PSYCHOLOGY

CUE ATTENTION HABITS AS A FACTOR IN TRAINING, by Gordon A. Eckstrand. U. S. Air Development Force. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, O. Aug 1951. 14p drawing, diagr, tables Microfilm $1.75, Photostat $2.50. PB 105962

Three groups of 40 subjects each learned a discriminative motor task which required that they associate four different response keys with four different colored forms. In this standard task both Color and Form were relevant cues, i.e., either stimulus aspect could be used to perform successfully on the task. Before learning this standard task, each of the groups had a different kind of preliminary training. Group A learned tasks in which Form was always relevant and Color always irrelevant. Group B learned tasks in which Color was always relevant and Form always irrelevant. Group C learned tasks in which both Form and Color were relevant. The forms and colors used in these preliminary tasks were different from those used in the standard task. In order to determine whether or not the preliminary training had a selective influence on which one of the relevant cues in the standard task was used to solve the problem, each of the groups was divided into two subgroups. In each case one sub-group learned a test task with only the forms from the standard task present and the other sub-group a test-task with only the standard task colors present. All learning was to a criterion. The test task with only forms present was learned most rapidly by Group B. The situation was reversed in the learning of the test task with only colors present. The results support the conclusion that cue attention habits established during training transfer to the learning of later, similar tasks. Implications for training device design are discussed. Experimental data were collected at Ohio State University under Contract no. AF33(038)-15474. AAF TR 6566.

FINAL REPORT ON PROJECT 6-ORI-158, ON THE DEVELOPMENT OF ABBREVIATED INDIVIDUAL INTELLIGENCE SCALES, by William A. Hunt. Northwestern University, Evanston, Ill. 1951. 2p Microfilm $1.25, Photostat $1.25. PB 105282

1. Psychological tests.

LEADERSHIP IDENTIFICATION AND ACCEPTANCE. REPORT ON PROGRESS AND PLANS. PROGRESS REPORT NO. 8, INSTITUTE REPORT SERIES A, NO. 10, by F. Loyal Greer, Joseph M. Masling, and P. Douglas Courtney. Institute for Research in Human Relations, Washington, D. C. Aug 1951. 35p tables Microfilm $2.25, Photostat $5.00. PB 105230

1. Leadership 2. Psychology, Applied.
Contract N8 onr-69401.

PSYCHOPHYSIOLOGICAL FACTORS IN SPATIAL ORIENTATION; PAPERS PRESENTED AT A MEETING OF THE NAVAL RESEARCH ADVISORY PANEL IN PSYCHOPHYSIOLOGY IN COOPERATION WITH THE U. S. NAVAL SCHOOL OF AVIATION MEDICINE, U. S. NAVAL AIR STATION, PENSACOLA, FLA., 30-31 OCT 1950. U. S. Office of Naval Research. Psychophysiological Branch. Oct 1950. 67p photos, diagrs, graphs, tables Microfilm $3.00, Photostat $8.75, PB 105632

1. Orientation, Spatial 2. NAVEXOS P-966.

Contents: Spatial disorientation in flight, by Capt. Ashton Graybiel. - Anatomy and physiology of the vestibular system, by Harlow W. Ades. - Cortical projection of postural impulses, by Walter A. Mickle and Harlow W. Ades. - Individual differences in mode of space orientation, by Herman A. Witkin. - Factors influencing the perception of the vertical, by Cecil W. Mann. - Some characteristics of vestibular eye movements, by George R. Wendt. - Studies to define quantitatively the stimulus required to produce motion sickness, by Walter H. Johnson. - Psychological effects of increased positive radial acceleration, by Neil D. Warren. - Lag effect associated with stimulation of the semicircular canals as indicated by the oculogyral illusion, by W. Brant Clark. - Effect of a change in direction of resultant force on sound localization: Audiogravic illusion, by Ashton Graybiel and Jorma I. Niven. - Age as a variable in post-rotational phenomena, by Frederick E. Guedry, Jr. - Operating principle of the vestibular mechanisms, by Robert Mayne. - Relation between visual and postural determinants of the phenomenal vertical, by James E. Gibson. - Some studies of visual perception of motion, by William H. Ittelson. - Summary, by Capt. Ashton Graybiel.

ROLE OF SUCCESS AND FAILURE IN DETERMINING ATTITUDE TOWARD THE GROUP AS A MEANS TO MEMBER GOALS, by Harry Shelley. Michigan. University. Dept. of Psychology. Jun 1950. 85p diagrs, tables Microfilm $3.75, Photostat $11.25. PB 105366

1. Psychology, Applied 2. Group behavior.

SOME DATA ON THE INFLUENCE OF ATTEMPTED INTERPOLATION ON THE SPEED AND ERRORS OF SCALE READING, by William E. Kappauf. U. S. Air

Materiel Command. Engineering Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. May 1951. 17p tables Microfilm $1.75, Photostat $2.50. PB 105546

This report presents data which indicate the manner in which the speed and errors of scale reading are influenced by a change in reading instruction from "Read to the nearest scale mark" to "Read to the nearest tenth of a scale division." The data were obtained in a short experiment in which 20 subjects read a series of simply designed, straight scales which were graduated every unit and numbered every 10. Their general instruction was to work as rapidly as possible. As compared with readings taken to the nearest unit, readings which are attempted to the nearest tenth of a unit required about one and one-half seconds additional reading time, entailed about 50% more reading errors, and had a larger mean square error. The error increase applied both to gross reading errors and to local errors which resulted in failures to obtain readings correct to the nearest unit. Data extracted from the records of Experiment 4 of the Princeton Laboratory series bear out these results. The data are interpreted to mean that the task of interpolating to tenths of divisions increases the reader's likelihood of making systematic errors. Readings to tenths would become superior only if better reading techniques, checking procedures or improve scale designs were developed which would eliminate gross errors. Contract no. W33-038-ac-14480. AAF TR 6530.

STRUCTURAL ENGINEERING

ADOBE BRICK CONSTRUCTION, by Morris M. Sparks. U. S. Office of Technical Services. Dec 1951. 14p Available from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D. C. Mimeo: $.50. PB 105844

1. Adobes 2. Earth construction 3. TAS 98.

APPLICATION OF EQUIVALENT VOLTAGES TO THE SLOPE DEFLECTION ANALYSIS OF STRUCTURES, by Fred H. Fenn. Louisiana. Engineering Experiment Station, Baton Rouge, La. 1951. 15p diagrs Available from Engineering Experiment Station, Louisiana State University, Baton Rouge, La. PB 105827

1. Structural analysis 2. Structures - Strains and stresses 3. L EES B22.

BEHAVIOUR IN COMPRESSION OF ALUMINIUM ALLOY PANELS HAVING A FLAT SKIN WITH CORRUGATED REINFORCEMENT, by E. A. Brook. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jul 1945. 33p photos, diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.90. PB 105779

This report describes compression tests on 36 panels, made of D.T.D. 390 and D.T.D. 546. Each panel consisted of a flat skin reinforced with continuous corrugations, and the object of the test was to investigate the effect of rivet pitch and arrangement, corrugation width, and skin and corrugation thickness, on the buckling and failing loads of the panels. The results indicate that for the thicknesses of skin and corrugations considered in this report, the inter-rivet buckling stress is considerably less than the stress at which the skin between rivets would buckle, when considered as an Euler strut with encastre ends S. O. Code no. 23-2598. Cover date is 1951. ARC RM 2598.

BUCKLING OF RECTANGULAR SANDWICH PLATES SUBJECTED TO EDGEWISE COMPRESSION WITH LOADED EDGES SIMPLY SUPPORTED AND UNLOADED EDGES CLAMPED, by Kuo Tai Yen, V. L. Salerno and N. J. Hoff. U. S. National Advisory Committee for Aeronautics. Jan 1952. 66p diagrs, graphs, table Microfilm $3.00, Photostat $8.75. PB 105973

The compressive stress for buckling is calculated for a rectangular flat sandwich plate with loaded edges simply supported and unloaded edges rigidly clamped. In the calculations Hoff's differential equations are integrated by Leggett's method to obtain lower bounds and by Galerkin's method to establish upper bounds. True values of the buckling stress are estimated as arithmetic means of these bounds and are presented in a diagram which covers the entire practical range of the geometric and mechanical quantities involved. PIB 164. NACA TN 2556.

CRITICAL COMBINATIONS OF BENDING, SHEAR, AND TRANSVERSE COMPRESSIVE STRESSES FOR BUCKLING OF INFINITELY LONG FLAT PLATES, by Aldie E. Johnson, Jr. and Kenneth P. Buchert. U. S. National Advisory Committee for Aeronautics. Dec 1951. 40p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105810

Three-dimensional interaction surfaces are presented for the computation of elastic buckling stresses for an infinitely long flat plate subjected to combinations of bending, shear, and transverse compression in its plane - a loading approximating that occurring in a shear web. Surfaces are presented for two sets of edge conditions: both edges simply supported, and lower edge simply supported, upper edge clamped. Present results are in good agreement with data for one-load and two-load limiting cases previously published. NACA TN 2536.

EFFECT OF INTERNAL PRESSURE ON THE INITIAL BUCKLING OF THIN-WALLED CIRCULAR CYLINDERS UNDER TORSION, by H. G. Hopkins and E. H. Brown. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jan 1946. 13p diagr, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.90. PB 105337

A theoretical investigation into the effect of internal pressure on the initial buckling of thin-walled circular cylinders under torsion is described in this paper, and a comparison is made with previous American experimental and theoretical work. The need for the investigation arose in the design of an engine nacelle for a jet-propelled aircraft, when it was required to estimate the effect of aerodynamic suction on the stability of the nacelle skin under torsion. The effect of internal pressure on a circular cylinder under torsion is to increase the critical

TECHNICAL REPORTS News letter

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No. 33, March 1952

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(see next page)

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PEST INFESTATION RESEARCH, 1949 is a 34-page report on the progress achieved in the British Government's Pest Control Research Program during 1949. It has separate chapters on the research progress in Biology, Grain Storage, Insecticides, Fumigants, and Isotope Tracers. Order from British Information Services, 30 Rockefeller Center, New York 7, N. Y. Price: 45¢.

"EVALUATION OF FUMIGANTS For Control of Insects Attacking Wheat and Corn in Steel Bins" is the title of a United States Department of Agriculture report on the best materials for combating insect infestation in grain stored on the farm. Order Agriculture Department Technical Bulletin No. 1045 from the Supt. of Documents, U.S. Government Printing Office, Washington 25, D. C. Price: 10¢.

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Helpful toward seeing through our scientific manpower difficulties are: (1) a survey by a visiting British Productivity team of the role of American Universities as a source of technical and scientific manpower for U. S. industry and (2) a series of Navy research studies on selection, evaluation and training of engineers and scientists. For survey and list of reports request (9B) and (9C) respectively.

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shear stress, to decrease the circumferential wavelength, and to increase the angle between the axis of the cylinder and the direction of the waves. Further, there is little difference in the values of these quantities for clamped and simply-supported edge conditions, and this difference decreases rapidly with the increase of internal pressure. The agreement between experimental and theoretical values of the critical shear stress is good. The increase in torsional stability with the internal pressure is most marked; this is well illustrated by the fact that, for the particular engine nacelle design considered, an aerodynamic suction of 2 lb/in. (which is considerably below the maximum design suction of 5 lb/in.) raises the buckling stress by some 60 to 70 percent. Cover date is 1951. S. O. Code no. 23-2423. ARC RM 2423.

FIXING FIBRE BUILDING BOARD WALL LININGS. Gt. Brit. Ministry of Works. 1950. 6p diagrs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105614
1. Fiberboard - Gt. Brit. 2. Walls - Linings - Gt. Brit. 3. MOW AL 17.

GERMAN TWO PIECE NAIL, DRAWING PINS AND BIFURCATED RIVET INDUSTRY, REPORTED BY B.I.O.S. TEAM NO. 1765: F. Kemp, Capt. H. A. Woolley, H. J. Wiles, F. G. Dixon, J. Cockcroft. British Intelligence Objectives Sub-Committee. Mar 1946. 35f Microfilm $2.25, Enlargement Print $6.25. PB 105656
1. Nails - Manufacture - Germany 2. Rivets - Manufacture - Germany 3. BIOS FR 1163. 4. Micro BIOS FD 3093/48, Frames 1-32.

HEAT LOSS FROM DWELLINGS. Gt. Brit. Dept. of Scientific and Industrial Research. Building Research Station, Watford, England. Oct 1951, 8p tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105613
1. Heat - Transference - Gt. Brit. 2. Insulation, Thermal - Buildings - Gt. Brit. 3. DSIR BRD 35. S. O. Code no. 72-22-0-35.

INDENTATION CHARACTERISTICS OF FLOOR COVERINGS USED OVER RADIANT FLOOR PANELS, by H. F. Mullikin and L. C. Horpedahl. Montana. Engineering Experiment Station, Bozeman, Mont. Dec 1950. 4p drawings, graph, table Available from The Director Montana State College Engineering Experiment Station, Bozeman, Mont. PB 105237
1. Heat, Radiant - Effect on floor coverings 2. Floor coverings - Effect of radiant heat 3. MO EES B11.

OIL VAPOR BURNER, by Lloyd Berg and Clark B. McKee. Montana. Engineering Experiment Station, Bozeman, Mont. Nov 1950. 6p drawings Available from The Director, Montana State College Engineering Experiment Station, Bozeman, Mont. PB 105234
1. Oil burners 2. MO EES B8.

PHOTO-ELASTIC EXAMINATION OF A CYLINDRICAL STRUT INTENDED FOR RECORDING COMPRESSIVE LOADS, by W.A.P. Fisher. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Feb 1947. 4p photos, diagrs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.35. PB 105678
Photo-elastic methods are used to establish how much of a cylindrical steel strut, mounted for measurement of compressive force by strain-gauges, has uniform stress distribution, even when the end load is concentrated near the axis of the strut. It is found that a strut 16 in long, and 6 in diameter has virtually uniform stress distribution over the middle 2 1/2 in. S. O. Code no. 23-2532. Cover date is 1951. ARC RM 2532.

PLASTERING ON PLASTERBOARD AND INSULATING FIBRE BUILDING BOARD. Gt. Brit. Ministry of Works. 1951. 4p Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105828
1. Plastering - Gt. Brit. 2. MOW AL 21.

PRINCIPLES OF NATURAL VENTILATION OF BUILDINGS. Gt. Brit. Dept. of Scientific and Industrial Research. Building Research Station, Watford, England. Sep 1951. 6p diagrs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105673
1. Ventilation - Buildings - Gt. Brit. 2. DSIR BRD 34.
S. O. code no. 72-22-0-34.

PROPERTIES OF HONEYCOMB CORES AS AFFECTED BY FIBER TYPE, FIBER ORIENTATION, RESIN TYPE, AND AMOUNT, by R. J. Seidl, D. J. Fahey and A. W. Voss. U. S. National Advisory Committee for Aeronautics. Nov 1951. 36p photos, diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105692
An investigation was conducted to determine the effect of fiber type, fiber orientation, resin type, and resin content on the strength properties of honeycomb core structures. The structures examined were made from nonwoven cotton, nonwoven rayon, and paper. Some cores had the principal fiber grain parallel to and others had it perpendicular to the cells of the honeycomb. One or more resins in varying amounts were used to impregnate or bond the three materials. NACA TN 2564.

SANDWICH CONSTRUCTION AND CORE MATERIALS, PART IV: NOTES ON SOME METHODS OF TESTING CORE MATERIALS, by F. T. Barwell. Gt. Brit. Ministry of Supply. Aeronautical Research Council. May 1946. 17p drawings Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.15. PB 105775
Partly as the result of theoretical investigation into the possibilities of sandwich construction of aircraft and partly because of the successful use of this principle in certain aircraft designed by Messrs. The de Havilland Aircraft Company, it became necessary to

study the mechanical properties of materials of density ranging from 0.05 to 0.5 grammes per c.c. for use as the core materials. During the recent war considerable effort was directed towards the development of home produced low-density material because it was believed that such material would have certain advantages over balsa wood and because the continued supply of balsa wood in the required quantities was rendered uncertain by war conditions. Some of the work carried on this problem at the National Physical Laboratory and the Chemical Research Laboratory on behalf of the Ministry of Aircraft Production is described in this series of reports. Part I, R. & M. No. 2123, provides a general introduction, Part II, R. & M. No. 2124, discusses the methods available for preparing low-density materials, and Part III, R. & M. No. 2125, develops the theory of instability of sandwich struts and beams having an aeolotropic core material. The present report, Part IV of the series, discusses factors which must be taken into account in testing low-density core materials. Because such materials usually consist of natural and synthetic high polymers expanded in a three-dimensional structure by the inclusion of cavities, their behaviour under test is governed by their macromolecular constitution modified by the characteristics of a "structure" as distinct from a solid material. The most important properties required in a core material are high specific stiffness in compression and shear. For the rapid evaluation of small samples of material a compression test has been devised wherein the deformations accompanying the repeated application and removal of a definite load are used to calculate an apparent modulus. This method has been found to yield more definite results than the conventional determination of a stress-strain curve. Modulus of rigidity may be determined from a tubular test piece in torsion or by a direct method wherein rectangular test pieces are glued to metal reinforcing pieces to which the shear force is applied. Other properties, such as tensile and compressive strength must also be taken into account, and an order of tests is described whereby unpromising material may be eliminated with a minimum of experimental work. S. O. Code no. 23-2467. Cover date is 1951. For pt. I see PB 92638, for pt. II see PB 92618, for pt. III see PB 92568. ARC RM 2467.

SIMPLE METHOD FOR THE APPROXIMATE COMPUTATION OF ALL THE NATURAL TORSIONAL FREQUENCIES OF A MEMBER WITH VARIABLE CROSS-SECTION, by Helmut Wittmeyer. Sweden. Kungl. Tekniska Högskolan. Institutionen för Flygteknik. Sep 1951. 41p diagrs, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105964

The method, using only one quadrature, allows the computation of good approximate values for all torsional eigenfrequencies of a member with "smoothly" varying cross-section. The approximate formula for the fundamental frequency of the member clamped at one end is derived by comparison of this with the fundamental frequency of a single-parameter group of spare members whose eigenfrequencies to a first approximation show the same asymptotic behaviour as those of the given member. From the frequencies of these spare members those resembling the approximate value required and nearest to it by the perturbation method are selected. The computation of the higher frequencies of the member clamped at one end, as also the fundamental and the upper frequencies of a member with other boundary conditions will, by suitably sub-dividing the member into part members, bring us back to computation of the eigenfrequency for the member clamped at one end. A very simple approximate formula for the $\underline{n}$-th eigenfrequency is drawn up in such a way that for $\underline{n} = 1$ it gives the approximate value assumed to be known for the fundamental frequency and for large $\underline{n}$ it gives values in the first approximation that are asymptotically correct. Detailed summary of a lecture given at the Royal Institute of Technology, Stockholm, on Oct 2, 1950. KTH AERO TN 13.

SOUND ABSORBENT TREATMENTS. Gt. Brit. Dept. of Scientific and Industrial Research. Building Research Station, Watford, England. Nov 1951. 10p graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.10. PB 105761

1. Sound - Absorption - Gt. Brit. 2. Soundproofing - Theory - Gt. Brit. 3. Insulating materials - Tests - Gt. Brit. 4. Auditoriums - Acoustic systems - Gt. Brit. 5. Acoustic materials - Gt. Brit. 6. Acoustic systems - Gt. Brit. 7. Walls - Insulation - Gt. Brit. 8. DSI R BRD 36.

S. O. Code no. 72-22-0-36.

STUDY OF THE VOUSSOIR ARCH, by A. J. Sutton Pippard and Letitia Chitty. Gt. Brit. Dept. of Scientific and Industrial Research. Building Research Station, Watford, England. 1951. 63p photos, diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.65. PB 105768

1. Arches, Voussoir - Gt. Brit. 2. DSIR NB TP 11.

S. O. code no. 47-551-11.

TECHNICAL APPROACH TO THE DESIGN OF RADIANT HEATING SYSTEMS IN MONTANA, by Chester A. Arents and James A. Trenerry. Montana. Engineering Experiment Station, Bozeman, Montana. Jan 1948. 27p diagrs, graphs, tables Available from Director, Montana State College Engineering Experiment Station, Bozeman, Mont. PB 105168

1. Heat, Radiant - Design 2. MO EES B2.

Montana State College Bulletin, Vol. 2, no. 3, Jan 1948.

TEORII TONKOSTENNYKH STERZHNEI. (THEORY OF THIN-WALLED RODS), by A. L. Goldenveizer. Oct 1951. 53p Microfilm $2.75, Photostat $7.50. PB 104948

Starting with the Love equations for bending of extensible shells, "principal stress states" are sought for a thin-walled rod of arbitrary but open cross section. Principal stress states exclude those local states arising from end conditions which damp out with distance from the ends. It is found that for rods of intermediate length, long enough to avoid local bending at a support, and short enough that elementary torsion and bending are not the most significant stress states, four principal states exist. Three of these states are associated with the planar distribution of axial stress and are equivalent to the engineering theory of extension and bending of solid sections.

The fourth state resembles that which has been called in the literature "bending stress due to torsional", except that cross sections are permitted to bend and the shear along the center line of the cross section is permitted to differ from zero. Translated from Prikladnaya matematika i mekhanika, v. 13, Nov.-Dec 1949, p. 561-596. NACA TM 1322.

TWO STAND POINTS TOWARDS MODERN ARCHITECTURE: WRIGHT AND LECORBUSIER, by Carl Birger Troedsson. Chalmers University of Technology, Gothenburg, Sweden. 1951. 22p photos, diagrs Microfilm $2.00, Photostat $3.75. PB 106003

1. Architecture - Sweden 2. Chalmers University of Technology, Gothenburg, Sweden. Transactions no. 113.

WITHDRAWL OF ROOF SUPPORTS AT FACES. MEMORANDUM BY THE YORKSHIRE ADVISORY COMMITTEE ON FALLS OF GROUND. Gt. Brit. Ministry of Fuel and Power. Yorkshire Advisory Committee on Falls of Ground. 1951. 12p photos, drawings Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.15. PB 105998

1. Mines and mining - Supports - Gt. Brit. 2. Coal mines and mining - Supports - Gt. Brit. 3. MEP SP 24.

F. S. Pollard, Chairman, H. M. Senior District Inspector of Mines. 41-9999.

TEXTILES AND TEXTILE PRODUCTS

DEGRADATION FROM WEATHERING OF TENTAGE FABRICES, by W.E.C. Yelland, Harris Research Laboratories, Washington, D. C. U. S. Office of the Quartermaster General. Military Planning Division. Research and Development Branch. Sep 1951. 154p graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $4.00. PB 105767

This report discusses principally the degradative behavior of 12.29 ounce duck exposed outdoors at two locations in the grey state, the mineral dyed state, and with a fire, water, weather and mildew resistant finish. The reaction of these samples to varying climatic conditions and to different portions of the solar spectrum was observed. In general, the portion of the spectrum found to be most responsible for deterioration was the short wave length ultraviolet, but it was also observed that the various finishes were influenced by other bands of the spectrum, as well. At Camp Lee, Virginia, and Miami, Florida - sites representative of temperature and semi-tropical climates, respectively - the samples were exposed both directly to the elements and under filters which permitted the passage of selected wave lengths of light. It was found that, in general, the FWWMR treated fabrics withstood degradation more effectively than either the mineral dyed or the grey. Deterioration in all cases seemed to be the result of hydrolysis and oxidation of the cellulose. Correlation was established between fabrics exposed in the form of panels and those exposed in the form of tents to determine whether the more convenient panel exposures yielded reliable data. Degradation of the fabrics was determined initially on the basis of exposure time and later, on the basis of the solar radiation received. It was found that the latter procedure was more reliable because of the differences in solar radiation at the two locations. QMC TSR 40.

QUARTERMASTER RESEARCH ON WATER RESISTANT TEXTILES, BY THE STAFF OF THE HARRIS RESEARCH LABORATORY, BASED ON WORK DONE AT THAT LABORATORY AND ALSO AT THE QUARTERMASTER RESEARCH AND DEVELOPMENT LABORATORIES, THE QUARTERMASTER BOARD, THE INSTITUTE OF TEXTILE TECHNOLOGY AND THE NATIONAL BUREAU OF STANDARDS. U. S. Office of the Quartermaster General. Military Planning Division. Research and Development Branch. Jun 1951. 195p photo, drawings, graphs, tables Available from Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Mimeo: $5.00. PB 105661

The report describes the broad program of research on both the fundamental and applied aspects of the subject which was carried out during the war and in the period immediately following. A description is given of a series of nozzles installed during the war in a "rain room" at the Philadelphia Quartermaster Depot to simulate accurately the conditions of natural rainfall in the three important parameters of intensity, drop size, and velocity. The rain room, and also the rain course later constructed on the same principle at Fort Lee, Virginia, were used as the final criterion for the evaluation of water-resistant garments and fabrics. They thus played an important role in determining the inherent water resistance of textile structures and the efficacy of water-repellent compounds. Some correlations have been established between the results of rain room tests and those of a number of different laboratory tests for water repellency, so that now laboratory repellency data can within certain limits be translated into terms of protection time under actual rainfall. The report is concerned not only with a study of water repellent compounds and their optimum conditions of application, but also with basic concepts regarding the design of textile structures with a high degree of inherent water resistance. The rain-room and laboratory testing of a group of fabrics especially designed according to the principles of water resistance proposed by the late Dr. F. T. Peirce of Shirley Institute shed much light on the effect of fabric structure on water resistance. The physics of wetting, as well as the mechanism of water repellency are discussed in the report, with special emphasis on the study of treating systems and the durability of water repellent agents. Concerning the design of water-repellent garments, the report stresses the value of the double layer principle in improving rain protection and also the importance of sewing the garments with water repellent thread so as to avoid penetration of the seams by capillary action. A special section is devoted to a study of the repellency of wool fabrics and garments. QMC TSR 37.

TRANSPORTATION EQUIPMENT

Aeronautics

Aircraft

CALCULATION OF AERODYNAMIC FORCES ON A PROPELLER IN PITCH OR YAW, by John L. Crigler and Jean Gilman, Jr. U. S. National Advisory Committee for Aeronautics. Jan 1952. 33p diagrs, graphs Microfilm $2.25, Photostat $5.00. PB 106116

An analysis was made to determine the applicability of existing propeller theory and the theory of oscillating airfoils to the problem of determining the magnitude of the forces on propellers in pitch or yaw. Strip calculations using compressible airfoil characteristics were first made as though steady-state conditions existed successively at several blade positions of the propeller blades during one revolution. A theory of oscillating airfoils in pulsating incompressible potential flow was then considered from which it was possible to determine factors which would modify the steady-state forces. NACA TN 2585.

CALCULATIONS ON THE FORCES AND MOMENTS FOR AN OSCILLATING WING-AILERON COMBINATION IN TWO-DIMENSIONAL POTENTIAL FLOW AT SONIC SPEED, by Herbert C. Nelson and Julian H. Berman. U. S. National Advisory Committee for Aeronautics. Jan 1952. 36p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105965

The linearized theory for compressible unsteady flow is used, as suggested in recent contributions to the subject, to obtain the velocity potential and the lift and moment for a thin, harmonically oscillating, two-dimensional wing-aileron combination moving at sonic speed. The velocity potential is derived by considering the sonic case as the limit of the linearized supersonic theory. The paper provides extensive tables of numerical values for the coefficients contained in the expressions for lift and moment, for various values of the reduced frequency $k(0 < k \leq 3.5)$ and aileron hinge position (from 10 to 90 percent of the wing chord). NACA TN 2590.

COMPARISON OF AIRSPEED CALIBRATIONS EVALUATED BY THE ACCELEROMETER AND RADAR METHODS, by Lindsay J. Lina and James P. Trant, Jr. U. S. National Advisory Committee for Aeronautics. Jan 1952. 16p photos, graphs, table Microfilm $1.75, Photostat $2.50. PB 106115

Airspeed calibration of the pitot-static installation on a jet fighter airplane was made to compare the accelerometer method of determining the static-pressure error with the radar method. The tests included shallow dives up to a Mach number of about 0.80 with pull-ups of about 4, 3, and 2g normal acceleration. The results of the test indicated that, for vertical plane maneuvers, the accelerometer method may be used as an alternate to the radar method. NACA TN 2570.

CONSIDERATIONS ON THE EFFECT OF WIND-TUNNEL WALLS ON OSCILLATING AIR FORCES FOR TWO-DIMENSIONAL SUBSONIC COMPRESSIBLE FLOW, by Harry L. Runyan and Charles E. Watkins. U. S. National Advisory Committee for Aeronautics. Dec 1951. 18p diagrs, graphs Microfilm $1.75, Photostat $2.50. PB 105812

This paper treats the effect of wind-tunnel walls on the oscillating two-dimensional air forces in a compressible medium. The walls are simulated by the usual method of placing images at appropriate distances above and below the wing. An important result shown is that, for certain conditions of wing frequency, tunnel height, and Mach number, the tunnel and wing may form a resonant system so that the forces on the wing are greatly changed from the condition of no tunnel walls. NACA TN 2552.

DESIGN OF TWO-DIMENSIONAL CHANNELS WITH PRESCRIBED VELOCITY DISTRIBUTIONS ALONG THE CHANNEL WALLS. II: SOLUTION BY GREEN'S FUNCTION, by John D. Stantiz. U. S. National Advisory Committee for Aeronautics. Jan 1952. 35p diagr, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105944

Methods of solution by Green's function are developed for the design of two-dimensional unbranched channels with prescribed velocities as a function of arc length along the channel walls. The methods apply to incompressible and linearized compressible, nonviscous irrotational flow. One numerical example is presented for an accelerating elbow with linearized compressible flow. The elbow shape obtained from the solution by Green's function is the same as that obtained from a solution by relaxation methods for the same prescribed conditions. The time required for the calculations is considerably less for solutions by Green's function. NACA TN 2595.

EFFECT OF CONDENSATION OF ATMOSPHERIC WATER VAPOUR ON TOTAL HEAD AND OTHER MEASUREMENTS IN THE N.P.L. HIGH SPEED TUNNELS, BY H. H. PEARCEY. NOTE ON THE INTERPRETATION OF READINGS OF PITOT AND STATIC TUBES IN A HIGH SPEED TUNNEL IN WHICH CONDENSATION OF MOISTURE IS TAKING PLACE, by C.N.H. Lock. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Feb 1944. 38p diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.25. PB 105771

1. Wind tunnels, High speed - Vapor condensation - Gt. Brit. 2. Condensation, Water vapor - Gt. Brit. 3. ARC RM 2249.

S. O. code no. 23-2249. Cover date is 1951.

EFFECT OF VARIOUS PARAMETERS INCLUDING MACH NUMBER ON THE SINGLE-DEGREE-OF-FREEDOM FLUTTER OF A CONTROL SURFACE IN POTENTIAL FLOW, by Harry L. Runyan. U. S. National Advisory Committee for Aeronautics. Dec 1951. 33p graphs, table Microfilm $2.25, Photostat $5.00. PB 105811

Calculations demonstrating the existence of single-degree-of-freedom flutter of a control surface are presented. The effect of various parameters such as Mach number, aerodynamic balance, structural damping, and inertia ratio are shown. Even though the calculations are based on potential-flow theory, the results should provide a logical basis or framework with which to examine oscillations of a control surface believed due to separated flow phenomena. NACA TN 2551.

EXPERIMENTAL INVESTIGATION INTO THE SUITABILITY OF A CORRUGATED CONSTRUCTION WING FOR A LAMINAR-FLOW AEROFOIL, by J. C. King. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jan 1945. 27p photos, diagrs (1 fold) graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $2.15. PB 105777

This report describes a detailed experimental investigation into the structural features of a 6-ft chord wing specimen having thick skin reinforced by spanwise corrugations. The tests include surface distortion, proof and ultimate tests on the specimen and compression tests on two panels. A short length of parallel specimen was used with a simplified test rig built for the purpose. These tests showed that for this specimen, provided the wing can be made smooth in the first place, it will not be adversely affected by loads imposed in service. The major protion of the surface distortion in flight will be due to the aerodynamic suction; the effect of direct and shear stresses being negligible. In the ultimate tests failure was due to elastic instability of the skin and corrugations at a compressive stress of 11.1 t/sq in. This compares favourably with the compressive stress at failure of the panels, which, when corrected for the shear stress present in the wing, reduces to 11.3 t/sq in. S. O. code no. 23-2530. Cover date is 1951. ARC RM 2530.

EXPERIMENTAL INVESTIGATION OF ROLLING PERFORMANCE OF STRAIGHT AND SWEPTBACK FLEXIBLE WINGS WITH VARIOUS AILERONS, by Henry A. Cole, Jr. and Victor M. Ganzer. U. S. National Advisory Committee for Aeronautics. Dec 1951. 45p diagrs, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105928

An experimental investigation was conducted to determine the performance in roll of two flexible wings, one swept back 45° and the other unswept. Rolling moments due to aileron deflection, damping derivatives in roll, and free-rolling angular velocities due to aileron deflection were obtained at various speeds including, when possible, the aileron reversal speed. NACA TN 2563.

EXPRESSIONS FOR THE RATES OF CHANGE OF CRITICAL FLUTTER SPEEDS AND FREQUENCIES WITH INERTIAL, AERODYNAMIC AND ELASTIC COEFFICIENTS, by G.H.L. Buxton and I. T. Minhinnick. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Sep 1945. 71p diagrs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $4.25. PB 105773

Formulae are derived which give the rates of change of the critical speeds and frequencies for flutter of an aeroelastic system of a general number of degrees of freedom, with each of the dynamical coefficients occurring in the equations of motion. The formulae enable the effect of a small change in one or more of the coefficients to be obtained when once the critical speed corresponding to a standard set has been found. A number of summation relations between the rates of change are obtained which serve as a check on the accuracy of the calculated values. Special forms of the formulae for binary flutter are given, and simple formulae for the rates of change of the critical speeds and frequencies when all the coefficients of a given type are changed in the same ratio are obtained for this particular case. The use of the formulae is illustrated in three worked examples. In an appendix the formulae are generalised to include the case when structural and artificial damping terms are present in the equations of motion. S. O. code no. 23-2444. Cover date is 1951. ARC RM 2444.

F-84F AIRPLANE MOCK-UP INSPECTION, by Charles Castellano. U. S. Air Force. Wright Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Chio. Dec 1951. 4p Microfilm $1.25, Photostat $1.25. PB 106091

1. F-84F (Airplane) 2. Airplanes - Inspection 3. AAF TSEAA MR S2-28.

FLIGHT INVESTIGATION OF THE EFFECT OF CENTER-OF-GRAVITY LOCATION ON GUST LOADS, by Jack Funk and Earle T. Binckley. U.S. National Advisory Committee for Aeronautics. Dec 1951. 18p diagrs, graphs, tables Microfilm $1.75, Photostat $2.50. PB 105938

Two jet-propelled airplanes were flown in rough air to investigate the effects of center-of-gravity location on gust loads. Data were obtained at centers of gravity of 20.9 and 27.5 percent mean aerodynamic chord for incremental load factor up to 1 g. The results indicate that a 6.6-percent forward movement of center of gravity decreases the gust loads by approximately 10 percent. The most frequently occurring distance from 1 g to peak acceleration was 17.5 chords. Calculations of the change in normal acceleration for a center-of-gravity movement from 20.9 to 27.5 percent mean aerodynamic chord for a single triangular gust having a gradient distance of 17.5 chords were in good agreement with the test results. NACA TN 2575.

FREE FLIGHT MEASUREMENTS AT SUPERSONIC SPEEDS OF THE DRAG OF A PARTICULAR DELTA WING HAVING A SIMPLE PRESSURE DISTRIBUTION, by P. J. Herbert. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 11p photo, diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.50. PB 105830

Squire has drawn attention to a family of delta wings, having aerofoil-like sections with a rounded leading edge, whose supersonic wave drag at zero incidence is theoretically determinable, so long as the leading edge is subsonic. Drag measurements have been made, at a Reynolds number of 7×10^6, on one member of this family using the ground-

launched rocket-boosted model technique. The experimental wave drag is in good agreement with tunnel measurements on another wing of the family, both methods giving values less than theory. S. O. code no. 23-9006-57. ARC CP 57.

H-21C ARMY AND USAF AIRCRAFT, COCKPIT AND CREW COMPARTMENT INSPECTION, by Daniel T. Murphy. U. S. Air Force. Wright Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1951. 3p Microfilm $1.25, Photostat $1.25. PB 106089

1. H-21C (Airplane) 2. Airplanes - Inspection 3. AAF TSEAA MR S2-24.

HIGH SPEED WIND TUNNEL TESTS ON MODELS OF TWO JET-PROPELLED FIGHTERS (METEOR AND VAMPIRE) BY THE STAFF OF THE R. A. E. HIGH SPEED WIND TUNNEL. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Oct 1945. 113p photos, diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $6.75. PB 105776

1. Airplanes, Jet propelled - Wind tunnel tests - Gt. Brit. 2. Airplanes, Jet propelled - Drag - Gt. Brit. 3. Airplanes, Jet propelled - Lift tests - Gt. Brit. 4. Airplanes, Jet propelled - Pitching moment - Gt. Brit. 5. Airplanes, Jet propelled - Stability - Gt. Brit. 6. Mach number - Effect 7. Meteor (Airplane) 8. Vampire (Airplane) 9. ARC RM 2504. S. O. code no. 23-2504. Cover date is 1951.

HYDRODYNAMIC INVESTIGATION OF A SERIES OF HULL MODELS SUITABLE FOR SMALL FLYING BOATS AND AMPHIBIANS, by W. C. Hugli, Jr. and W. C. Axt. U. S. National Advisory Committee for Aeronautics. Nov 1951. 122p photos, diagrs, graphs, tables Microfilm $5.00, Photostat $16.00. PB 105501

Results of an investigation to obtain hydrodynamic information on a series of hull models suitable for small flying boats or amphibians of from 2000 to 5000 pounds gross weight are presented. The series of hulls consisted of a basic hull with simple lines with plus or minus variations to this design in which the beam, sternpost angle, and afterbody length were altered. Modifications were also investigated to determine the advantage of refining the hull lines. The hulls were tested for hydrodynamic resistance and main spray. On the basis of these characteristics, the best beam and sternpost angle were selected for each of the three afterbody lengths investigated. The resulting three hulls were further tested for landing and porpoising characteristics. NACA TN 2503.

IMPULSE-MOMENTUM METHOD FOR CALCULATING LANDING-GEAR CONTACT CONDITIONS IN ECCENTRIC LANDINGS, by Robert T. Yntema and Benjamin Milwitzky. U. S. National Advisory Committee for Aeronautics. Jan 1952. 60p diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 106135

An impulse-momentum method for determining impact conditions for landing gears in eccentric landings is presented. The analysis is primarily concerned with the determination of landing-gear contact velocities for impacts subsequent to initial touchdown in eccentric landings and with the determination of the effective mass acting on each landing gear. Calculated results are presented which indicate the effects of such factors as landing-gear configuration and location, wing lift, side drift, angle of roll, and initial rolling velocity. A brief study of the effects of variable aerodynamic lift and damping in roll is also presented. NACA TN 2596.

INCOMPRESSIBLE POTENTIAL FLOW PAST TWO-DIMENSIONAL AEROFOILS WITH ARBITRARY SURFACE SUCTION, by W. T. Lord. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 44p diagrs, graphs, table Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $2.40. PB 105770

The problem of the incompressible potential flow past a conventional aerofoil which has an arbitrary distribution of normal velocity across its surface is solved by the application of conformal transformation to the solution derived for the corresponding problem for the unit circle. Several simple worked examples are given. Although it is theoretically possible to obtain any desired tangential velocity distribution on an aerofoil by the correct choice of suction velocity distribution, and this use of "sink effect" gives promise of considerable lift increments, it is considered that the quantities of suction required to produce such desired effects are prohibitively large for immediate practical use. For suction quantities of the order of those at which boundary-layer porous suction is designed to act, the effect of the suction on the main stream potential flow is negligible. S. O. code no. 23-9006-56. ARC CP 56.

INFLUENCE OF WING AND FUSELAGE ON THE VERTICAL-TAIL CONTRIBUTION TO THE LOW-SPEED ROLLING DERIVATIVES OF MIDWING AIRPLANE MODELS WITH 45° SWEPTBACK SURFACES, by Walter D. Wolhart. U. S. National Advisory Committee for Aeronautics. Dec 1951. 55p photo, diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105942

Results are presented of an investigation to determine the influence of the wing and fuselage on the vertical-tail contribution to the rolling derivatives of midwing airplane models with 45° sweptback surfaces. Comparisons are also made between measured and calculated vertical-tail contributions to the rolling derivatives which include corrections for the effect of fuselage and wing sidewash due to roll. NACA TN 2587.

INVESTIGATION AT LOW SPEED OF 45° AND 60° SWEPTBACK, TAPERED, LOW-DRAG WINGS EQUIPPED WITH VARIOUS TYPES OF FULL-SPAN, TRAILING-EDGE FLAPS, by John J. Harper. U. S. National Advisory Committee for Aeronautics. Oct 1951. 53p photos, diagrs, graph, tables Microfilm $2.75, Photostat $7.50. PB 105415

An investigation was made to determine the low-speed aerodynamic characteristics of two sweptback, low-drag, tapered wings equipped with full-span split and slotted flaps and three special types of trailing-edge flaps. Sweep angles of 45° and 60° measured at

the quarter chord were used. The results showed no appreciable gain in maximum lift coefficients for either the split flap or the special flaps on the 60° model but these same flaps did produce an increment in lift on the 45° model. The slotted flap produced the largest increase in lift on both models. The effect of the flaps on drag and pitching moment is the same as that indicated by other test data available. The slotted flap caused the largest increase in pitching moment for a given deflection angle. All flap configurations increased the stability of both wings. NACA TN 2468.

INVESTIGATION IN FLIGHT OF THE INDUCED VELOCITY DISTRIBUTION UNDER A HELICOPTER ROTOR WHEN HOVERING, by P. Brotherhood. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 16p photos, diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.15. PB 105620

1. R-4B (Helicopter) 2. Helicopters - Flight tests - Gt. Brit. 3. Helicopters - Rotors - Induced velocity - Gt. Brit. 4. Helicopters - Hovering - Gt. Brit. 5. ARC RM 2521.

S. O. code no. 23-2521.

INVESTIGATION OF AIRCRAFT HEATERS, XXXVIII: DETERMINATION OF THERMAL PERFORMANCE OF RECTANGULAR- AND TRAPEZOIDAL-SHAPED INNER-SKIN PASSAGES FOR ANTI-ICING SYSTEMS, by L.M.K. Boelter, V. D. Sanders and F. E. Romie. U. S. National Advisory Committee for Aeronautics. Nov 1951. 21p photos, diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105540

An investigation was conducted to determine the thermal and hydrodynamic behavior of air in the downstream portion of two types of double-skin passages used in heated-air leading-edge anti-icing systems. The downstream average unit thermal conductance in the turbulent region was 30 to 35 percent below that given by the commonly used equations. In the laminar region, the experimental unit conductance was about 30 percent below the predicted values for rectangular ducts but for trapezoidal ducts the data were much lower than the predicted values. NACA TN 2524.

LANDING CHARACTERISTICS IN WAVES OF THREE DYNAMIC MODELS OF FLYING BOATS, by James M. Benson, Robert F. Havens and David R. Woodward. U. S. National Advisory Committee for Aeronautics. Jan 1952. 41p photo, diagrs, tables, graphs Microfilm $2.50, Photostat $6.25. PB 105934

Powered models of three different flying boats were landed in oncoming waves of various heights and lengths. The effects of varying the trim at landing, the deceleration after landing, and the size of the waves were determined. Data are presented on the motions and accelerations obtained during landings in rough water. NACA TN 2508.

LATERAL CONTROL WITH HIGH LIFT DEVICES, by A. D. Young, with appendix by R. R. Duddy. Gt. Brit. Ministry of Supply. Aeronautical Research Council. May 1941. 36p diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $2.00. PB 106015

A brief summary of the main characteristics of the various devices considered is found in Table 1. No satisfactory method of lateral control has yet been developed that permits full use of the high-lift devices covering the complete wing span, although there is a reasonable hope that a satisfactory spoiler control will yet be developed. For the present, methods of lateral control must be accepted which restrict to some extent the span or type of flap; a number of such methods which are fairly satisfactory are available. The loss of possible lift increment incurred in their use need not be greater than about 15 per cent. of the increment due to full-span flaps. Cover date is 1951. S. O. Code no. 23-2583. Contents: Appendix I, by R. R. Duddy. p. 19-36. ARC RM 2583.

LINEARIZED CHARACTERISTICS METHOD AND ITS APPLICATION TO PRACTICAL NON-LINEAR SUPERSONIC PROBLEMS, by Antonio Ferri. U. S. National Advisory Committee for Aeronautics. Oct 1951. 65p diagrs Microfilm $3.00, Photostat $8.75. PB 105512

The method of characteristics has been linearized by assuming that the flow field can be represented as a basic flow field determined by nonlinearized methods and a linearized superposed flow field that con siders small changes in boundary conditions. The method has been applied to two-dimensional rotational flow, to calculations of axially symmetric flow, to slender bodies without symmetry, and to wing problems. NACA TN 2515.

LOW-SPEED MODEL TESTS ON TWO "V" WINGS, by J. Trouncer and D. Kettle. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Dec 1947. 86p photos, drawings, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $5.25. PB 105335

1. Airplanes - Stalling devices - Gt. Brit. 2. Wings, Sweptback - Stability - Gt. Brit. 3. Gliders, Tailless - Models - Tests - Gt. Brit. 4. Gliders, "V" wing - Models - Tests - Gt. Brit. 5. Stability, Longitudinal - Tests - Gt. Brit. 6. Stability, Lateral - Tests - Gt. Brit. 7. Stability, Directional - Tests - Gt. Brit. 8. Mathematics, Applied - Aerodynamics - Gt. Brit. 9. Wind tunnel tests - Gt. Brit. 10. Model testing - Gt. Brit. 11. Low-speed model tests on two "V" wings 12. ARC RM 2364.

Cover date is 1951. S. O. Code no. 23-2364. Contents: Part I: Longitudinal and lateral stability tests on two "V" wings of 28.4 deg. and 36.4 deg. sweepback without anti tip-stalling devices (tests made in no. 1. 11 1/2-ft. tunnel). - Part II: Tests of anti tip-stalling devices on two "V" wings of 28.4 deg. and 36.4 deg. sweepback (tests made in no. 1, 11 1/2-ft. tunnel). - Part III. Force measurements and pressure plotting tests on a 36.4 deg. sweepback "V" wing (tests made in the 24-ft. tunnel).

LOW-SPEED WING-TUNNEL TESTS ON THE BAYNES CARRIER WING, A TAILLESS GLIDER, by J. Trouncer. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Nov 1947. 41p drawings, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $2.40 PB 105912

1. Gliders - Wind tunnel tests - Gt. Brit. 2. Baynes carrier wing 3. ARC RM 2487.
Cover date is 1951. S. O. code no. 23-2487.

MEASUREMENT OF AIRCRAFT ATTITUDE RELATIVE TO FLIGHT PATH DURING DIVES, by J.E.H. Braybon. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jan 1947. 11p photos, diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.75. PB 105778

This report deals with the development of a technique for direct recording of the attitude of an aircraft relative to flight path during dives, i.e., the direction of incidence of free airflow relative to aircraft datum, using a wind vane coupled to a Desynn transmitter. Results obtained in dives under steady conditions of dive angle and A.S.I. show agreement with those deduced from level flight results using the conventional airflow-incidence/lift-coefficient relation. Included are the details of the instrumentation required to obtain simultaneous records of the flight conditions (A.S.I. height, dive angle) and corresponding incidence under non-steady conditions such as exist during rocketry attacks. S. O. code no. 23-2564. Cover date is 1951. ARC RM 2564.

MEASUREMENT OF THE DERIVATIVE Z_W FOR AN OSCILLATING AEROFOIL, by A. L. Buchan, K. D. Harris, and P. M. Somervail. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 32p diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.15. PB 105676

1. Damping derivatives - Coefficients - Gt. Brit. 2. Airfoils - Damping coefficient - Gt. Brit. 3. ARC CP 52.
S. O. code no. 23-9006-52.

MINIMUM WAVE DRAG OF BODIES OF REVOLUTION WITH A CYLINDRICAL CENTER SECTION, by Franklyn B. Fuller and Benjamin R. Briggs. U. S. National Advisory Committee for Aeronautics. Oct 1951. 34p diagrs Microfilm $2.25, Photostat $5.00. PB 105544

The minimum wave-drag problem with auxiliary conditions is solved for axial flow about bodies of revolution consisting of two symmetrical ogival sections joined by a circular cylinder. The auxiliary conditions are that the total length, the length of the cylinder, the frontal area, and the volume are held constant. The results are related to similar results known for bodies of revolution without a cylindrical midsection, and it is found that the addition of small amounts of center section has little effect on the drag. The maximum thickness ratio leading to the least total of wave and friction drag is investigated briefly. NACA TN 2535.

NOTES ON THE TAIL-FIRST AEROPLANE, by S. B. Gates. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jul 1939. 9p diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.65. PB 105389

1. Tail surfaces - Design - Gt. Brit. 2. ARC RM 2676.
Cover date is 1951. S. O. Code no. 23-2676.

NUMERICAL DETERMINATION OF INDICIAL LIFT OF TWO-DIMENSIONAL AIRFOILS AT SUBSONIC MACH NUMBERS FROM OSCILLATORY LIFT COEFFICIENTS WITH CALCULATIONS FOR MACH NUMBER 0.7, by Bernard Mazelsky. U. S. National Advisory Committee for Aeronautics. Dec 1951. 38p diagrs, tables Microfilm $2.25, Photostat $5.00. PB 105821

The indicial lift and moment on an airfoil experiencing a sudden acquisition of vertical velocity is calculated for Mach number 0.7 from the available flutter coefficients for an oscillating airfoil. An approximate calculation is also made for the indicial-lift function due to penetration of a sharp-edged gust. NACA TN 2562.

OBSERVATIONS OF THE INTERACTION BETWEEN THE SHOCK WAVES AND BOUNDARY LAYERS AT TRAILING EDGES OF AEROFOILS IN SUPERSONIC FLOW, by D. W. Holder and R. J. North. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 12p photos, diagr, table Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.50. PB 105769

Photographs have been taken of the flow at the trailing edges of three unyawed, two-dimensional, aerofoils placed in an airstream moving with a Mach number of 1.6 and giving a Reynolds number (based on chord) of 0.8×10^6. It is found that the conditions close to the trailing edge depend on the strength of the trailing-edge shock, particularly if the boundary layer is laminar ahead of the shock. S. O. code no. 23-9006-53. ARC CP 53.

OBSERVATIONS OF THE SUPERSONIC FLOW ROUND A 6 PER CENT DOUBLE WEDGE, by D. W. Holder, A. Chinneck and D. G. Hurley. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Dec 1950. 12p photos, diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.65. PB 106017

Surface pressure measurements and flow photographs have been taken for a 6% thick two-dimensional symmetrical double wedge at angles of incidence between 0^o and 8^o. The free-stream Mach number was 1.57, and the Reynolds number based on chord 0.8×10^6. Although the results are in general in agreement with exact theory, discrepancies occur at mid-chord where the expansion is observed to be more gradual than would be expected in the absence of the boundary layer, and close to the trailing edge where separation occurs when the aerofoil is at incidence. Shock waves were observed at the nose and tail under conditions for which expansions alone would be expected. That at the nose is attributed to the fact that the leading edge was not sharp but 0.001'' thick, and that at the tail may arise because the tail is blunt or because the flow separates from the other surface of the aerofoil. Cover date is 1951. S. O. code no. 23-9006-63. ARC CP 63.

PILOT ESCAPE FROM SPINNING AIRPLANES AS DETERMINED FROM FREE-SPINNING-TUNNEL TESTS, by Stanley H. Scher. U. S. National Advisory Committee for Aeronautics. Oct 1951. 36p photos, diagrs, tables Microfilm $2.25, Photostat $5.00. PB 105494

Procedure for pilot escape from spinning airplanes has been determined by means of tests in which pilot escape was simulated from 21 airplane models spinning in the Langley 20-foot free-spinning tunnel. The results in general indicated that the pilot should bail out of the outboard side. Calculated centripetal accelerations acting on the pilot during a spin are presented. NACA TN 2485.

PITCHING-MOMENT DERIVATIVES C_{M_Q} and $C_{M_{\dot{\alpha}}}$ AT SUPERSONIC SPEEDS FOR A SLENDER-DELTA-WING AND SLENDER-BODY COMBINATION AND APPROXIMATE SOLUTIONS FOR BROAD-DELTA-WING AND SLENDER-BODY COMBINATIONS, by Arthur Henderson, Jr. U. S. National Advisory Committee for Aeronautics. Dec 1951. 29p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105924

The pitching-moment derivatives C_{m_q} and $C_{m_{\dot{\alpha}}}$ for supersonic speeds are developed for a slender-delta-wing and slender-body combination having no afterbody. By drawing an analogy between the aerodynamics of the wing-body section of the configuration and the aerodynamics of a delta wing alone, the results for the slender-delta-wing and slender-body combination are modified to the extent that approximate solutions for C_{m_q} and $C_{m_{\dot{\alpha}}}$ for broad-delta-wing and slender-body combinations can be obtained. NACA TN 2553.

PRESSURE MEASUREMENTS IN A SUPERSONIC TUNNEL ON A TWO-DIMENSIONAL AEROFOIL OF R.A.E. 104 SECTION, by D. W. Holder, A. Chinneck and R. J. North. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Dec 1950. 13p photos, diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.45. PB 106016

Measurements of the pressure distribution over the surface of a two-dimensional aerofoil of R.A.E. 104 section have been made at a Reynolds number of about 0.8×10^6 and at free-stream Mach numbers of 1.42, 1.60 and 1.79. The observations included schlieren photography of the flow, and were made at angles of incidence of 0° and 2°. Cover date is 1951. S. O. Code 23-9006-62. ARC CP 62.

PROPOSAL FOR AN ELEVATOR MANEUVERABILITY CRITERION, by S. B. Gates. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jun 1942. 15p graphs, table Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 105411

1. Airplanes - Maneuverability - Gt. Brit. 2. Elevators, Aircraft - Stability - Gt. Brit. 3. Tabs, Trim - Gt. Brit. 4. ARC RM 2677.

Cover date is 1951. S. O. Code no. 23-2677.

RELATIVE STRENGTH AND STIFFNESS PROPERTIES REQUIRED FOR STRUT MATERIALS, by A. G. Pugsley. Gt. Brit. Ministry of Supply. Aeronautical Research Council. 1951. 11p graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.75. PB 105619

This paper considers the strength and stiffness properties required of a material for use in struts, taking as a measure of efficiency the weight of the uniform strut necessary to carry safely a given compression load P between two points distant L apart. Particular attention is given to the relative merits of increasing the equivalent yield stress p_y or the modulus of elasticity E of a given material. This depends on the slenderness ratio L/k adopted, which is itself shown to depend mainly on the ratio E/p_y for the material concerned and on the value of the structure loading coefficient P/L^2 compared with the stress p_y. Reasons for the choice of particular slenderness ratios in practice are discussed, some account being taken of relevant practical considerations. As regards existing steels and light alloys, and the relative merits of increasing p_y or E, it is concluded broadly that whilst with steels with p_y values of about 20 tons per square inch an increase of this trength is preferable for applications in heavy engineering structures, with aluminium alloys of high strength (p_y greater than 25 tons per square inch) some increase of E would be better for lightly loaded aeronautical structures. S. O. code no. 23-2490. ARC RM 2490.

REVIEW OF THE PROBLEM OF CHOOSING A CLIMB TECHNIQUE, WITH PROPOSALS FOR A NEW CLIMB TECHNIQUE FOR HIGH PERFORMANCE AIRCRAFT, by K. J. Lush. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jun 1948. 15p graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 106001

1. Aircraft, High altitude - Climb - Gt. Brit. 2. Airplanes - Climb - Gt. Brit. 3. ARC RM 2557.

Cover date is 1951. S. O. Code no. 23-2557.

SABRE 45 AIRPLANE, MOCK-UP INSPECTION, by D. T. Murphy. U. S. Air Force. Wright Air Development Center. Research Division, Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1951. 4p Microfilm $1.25, Photostat $1.25. PB 106095

1. Sabre 45 (Airplane) 2. Airplanes - Inspection 3. AAF TSEAA MR 441-174.

SEMIEMPIRICAL PROCEDURE FOR COMPUTING THE WATER-PRESSURE DISTRIBUTION ON FLAT AND V-BOTTOM PRISMATIC SURFACES DURING IMPACT OR PLANING, by Robert F. Smiley. U. S. National Advisory Committee for Aeronautics. Dec 1951. 28p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105926

A semiempirical procedure is presented for computing the water-pressure distribution on flat and V-bottom prismatic surfaces during planing or landings. For the rectangular flat plate, calculated and experimental pressure distributions are in good agreement for trims below 30° and for wetted-length-beam ratios at least up to 3.3. For the case of a V-bottom prismatic surface with appreciable chine immersion, the pressures on chine-immersed sections of a model having an angle of dead rise of 30° are similar to those on the corresponding flat plate so that a simple modification of the flat-plate procedure can be used to predict approximately the pressures on V-bottom surfaces. NACA TN 2583.

SOME EFFECTS OF VARIATIONS IN SEVERAL PARAMETERS INCLUDING FLUID DENSITY ON THE FLUTTER SPEED OF LIGHT UNIFORM CANTILEVER WINGS, by Donald S. Woolston and George E. Castile. U. S. National Advisory Committee for Aeronautics. Dec 1951. 40p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105813

An experimental investigation has been made of some effects of variations in several parameters, including fluid density, on the flutter characteristics of light uniform cantilever wings. Special emphasis has been placed on low values of the relative-density parameter $1/\sqrt{k}$, where k is the ratio of fluid density to wing mass. The experimental investigation has been supplemented by an analytical investigation. In general, the theoretical results followed the trends indicated by experiment except at low values of the relative density parameter and, in this region, additional analytical investigation seems necessary. NACA TN 2558.

SOME EFFECTS OF VARYING THE DAMPING IN PITCH AND ROLL ON THE FLYING QUALITIES OF A SMALL SINGLE-ROTOR HELICOPTER, by John P. Reeder and James B. Whitten. U. S. National Advisory Committee for Aeronautics. Jan 1952. 23p photos, graphs, tables Microfilm $2.00, Photostat $3.75. PB 106114

Flight-test measurements and pilots' opinions of the longitudinal flying qualities and lateral control characteristics of a small single-rotor helicopter are presented in which the damping of the helicopter in pitch and roll was varied by means of a rate sensitive automatic-control device from the amount present in the helicopter with the device inoperative to nearly three times that amount. NACA TN 2459.

STABILITY AND CONTROL CHARACTERISTICS OF A COMPLETE AIRPLANE MODEL HAVING A WING WITH QUARTER-CHORD LINE SWEPT BACK 40°, ASPECT RATIO 2.50, AND TAPER RATIO 0.42, by Marvin Schulderfrei, Paul Comisarow and Kenneth W. Goodson. U. S. National Advisory Committee for Aeronautics. Dec 1951. 86p photos, diagrs, graphs Microfilm $3.75, Photostat $11.25. PB 105808

An investigation has been made of a complete airplane model having a wing with the quarter-chord line swept back 40°, aspect ratio 2.50, and taper ratio 0.42 to determine its low-speed stability and control characteristics. The longitudinal stability investigation included stabilizer and tail-off tests with different wing dihedral angles ($\Gamma = 0°$ and $\Gamma = -10°$) over an angle-of-attack range for the cruising and landing configurations and tests with a high horizontal-tail location ($\Gamma = -10°$) for the cruising configuration. Tests were made of the wing alone and to determine the effect of wing end plates in pitch. Lateral stability characteristics were determined for the airplane with different geometric wing dihedrals, with end plates, and with several dorsal modifications. Tests were made with ailerons and spoilers to determine control characteristics. NACA TN 2482.

STRESS DIFFUSION ADJACENT TO GAPS IN THE INTER-SPAR SKIN OF A STRESSED-SKIN WING, by M. Fine and H. G. Hopkins. Gt. Brit. Ministry of Supply. Aeronautical Research Council. May 1942. 13p diagrs, graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.90. PB 105780

The diffusion of stress in the neighbourhood of chordwise gaps in the wing surface is an important structural design problem. Such gaps occur at wing joints and at undercarriage and bomb-bay cut-outs, and can involve local stress concentrations which require to be estimated. This report gives, subject to certain simplifications (including representation of the stringers by an equivalent sheet, carrying direct end load only), a theoretical analysis of the problem, and derives formulae for the stress distribution. Approximate formulae are found for (i) the direct stress in the flanges and (ii) the shear stress in the skin at the flanges and at the chordwise gap. These approximate formulae, applicable with negligible error when chordwise gaps are not closer than about one and a half times the inter-spar distance, enable a rapid estimate to be made of the stress concentration. A numerical example to illustrate the application to design is given, and shows that the maximum additional skin shear stress can be as much as two to three times the maximum additional flange direct stress. Although various factors (for example, flexibility of riveted joints between the spar flanges and the skin, local buckling and plastic flow) are likely to reduce the stress concentration if present calculations predict it to be high, some reinforcement of the skin is likely to be necessary. S. O. code no. 23-2618. Cover date is 1951. ARC RM 2618.

THEORETICAL AERODYNAMIC CHARACTERISTICS OF A FAMILY OF SLENDER WING-TAIL-BODY COMBINATIONS, by Harvard Lomax and Paul F. Byrd. U. S. National Advisory Committee for Aeronautics. Nov 1951. 76p diagrs, graphs Microfilm $3.50, Photostat $10.00. PB 105754

The aerodynamic characteristics of an airplane configuration composed of a swept-back, nearly constant chord wing and a triangular tail mounted on a cylindrical body are presented. The analysis is based on the assumption that the free-stream Mach number is near unity or that the configuration is slender. The calculations for the tail are made on the assumption that the vortex system trailing back from the wing is either a sheet lying entirely in the plane of the flat tail surface or has completely "rolled up" into two point vortices that lie either in, above, or below the plane of the tail surface. NACA TN 2554.

THEORETICAL ANALYSIS OF SOME SIMPLE TYPES OF ACCELERATION RESTRICTORS, by William H. Phillips. U. S. National Advisory Committee for Aeronautics. Dec 1951. 35p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00, PB 105937

Acceleration restrictors which work on the principle of stopping the upward motion of the elevator when the signal from an acceleration-sensing device reaches a certain value have been analyzed for representative fighter and transport airplanes over a range of altitude and center-of-gravity positions. NACA TN 2574.

THEORETICAL ANALYSIS OF THE EFFECT OF SEVERAL AUXILIARY DAMPING DEVICES ON THE

LATERAL STABILITY AND CONTROLLABILITY OF A HIGH-SPEED AIRCRAFT, by Ordway B. Gates, Jr. U. S. National Advisory Committee for Aeronautics. Dec 1951. 39p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105815

An investigation has been made to determine the effect of several auxiliary damping devices on the lateral stability and controllability of a present-day high-speed airplane. The results are presented in the form of aircraft motions subsequent to applied yawing or rolling moments, comparisons of the time to damp to half amplitude and the period of the lateral modes of motion, rudder motion required for zero sideslip subsequent to an aileron deflection, and combinations of rudder and aileron deflection necessary to perform steady turning maneuvers for each of the investigated damping devices. NACA TN 2565.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CONDENSATION OF AIR IN HYPERSONIC WIND TUNNELS, by H. Guyford Stever and Kenneth C. Rathbun. U. S. National Advisory Committee for Aeronautics. Nov 1951. 79p photos, diagrs, graphs Microfilm $3.50, Photostat $10.00 PB 105814

Presents results of theoretical and experimental investigation of condensation of air in hypersonic wind tunnels. The experimental work was done in a tunnel with Mach number of approximately 7. Condensation was detected and measured by condensation-fog light scattering, static-pressure measurements, and changes in wedge shock angle at degrees of supersaturation considerably lower than those predicted by existing condensation theory. Effects of varying supply pressures and temperatures were also measured. The nucleation theory of condensation was modified to take account of a postulated variation of surface tension with decrease in size of spontaneously formed drops which act as nuclei of condensation. The modified theory was applied to pure oxygen and nitrogen and its predictions were compared with those of the unmodified theory. NACA TN 2559.

THEORETICAL CHARACTERISTICS OF TWO-DIMENSIONAL SUPERSONIC CONTROL SURFACES, by Robert R. Morrissette and Lester F. Oborny. U. S. National Advisory Committee for Aeronautics. Oct 1951. 74p diagrs, graphs, tables Microfilm $3.50, Photostat $10.00. PB 105474

The "Busemann second-order-approximation theory" for the pressure distribution over a two-dimensional airfoil in supersonic flow was used to determine some of the aerodynamic characteristics of uncambered symmetrical parabolic and double-wedge airfoils with leading-edge and trailing-edge flaps. The characteristics presented and discussed in this paper are: flap effectiveness factor, rate of change of hinge-moment coefficient with flap deflection, rate of change of the pitching-moment coefficient about the midchord with flap deflection, and the location of the center of pressure of the airfoil-flap combination. Supersedes the recently declassified NACA RM L8G12, "Theoretical characteristics of two dimensional supersonic control surfaces", by Robert R. Morissette and Lester F. Oborny, 1948. NACA TN 2486.

TRANSONIC FLOW PAST A WEDGE PROFILE WITH DETACHED BOW WAVE. DETAILS OF ANALYSIS, by Walter G. Vincenti and Cleo B. Wagoner. U. S. National Advisory Committee for Aeronautics. Dec 1951. 48p diagrs, graphs, tables Microfilm $2.50, Photostat $6.25. PB 105858

Details are given of the calculations of the flow with detached bow wave past a doubly symmetrical, double-wedge profile at zero angle of attack. The results of these calculations have been previously described. See also NACA TN 2339 (PB 103366). NACA TN 2588.

24-FT TUNNEL TESTS ON A HIGH-LIFT MODEL: DOWNWASH AND VELOCITY MEASUREMENTS AT THE TAILPLANE, by C. H. Naylor. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Mar 1942. 10p photo, fold graphs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.90. PB 105225

1. Tail surfaces - Downwash - Measurements - Gt. Brit. 2. Tail surfaces - Velocity - Measurements - Gt. Brit. 3. Airplanes - Models - Tests - Gt. Brit. 4. Wind tunnel tests - Gt. Brit. 5. ARC RM 2649.

Cover date is 1951. S. O. Code no. 23-2649.

VELOCITY-CORRECTION FORMULA FOR THE CALCULATION OF TRANSONIC MACH NUMBER DISTRIBUTIONS OVER DIAMOND-SHAPED AIRFOILS, by H. Reese Ivey and Keith C. Harder. U. S. National Advisory Committee for Aeronautics. Nov 1951. 28p diagrs, graphs Microfilm $2.00, Photostat $3.75. PB 105711

A velocity-correction formula is proposed for the purpose of calculating, from the known Mach number distribution for a diamond-shaped airfoil, at a stream Mach number of 1.0, Mach number distributions on the same airfoil at speeds from a Mach number of about 0.8 to shock-attachment Mach number. An expression for the rate of change of local Mach number with stream Mach number is derived and an explicit equation for the drag coefficient as a function of stream Mach number and thickness ratio is given. NACA TN 2527.

WIND-TUNNEL TESTS AT LOW SPEED OF SWEPT AND YAWED WINGS HAVING VARIOUS PLAN FORMS, by Paul E. Purser and M. Leroy Spearman. U. S. National Advisory Committee for Aeronautics. Dec 1951. 82p photos, diagrs, graphs, tables Microfilm $3.75, Photostat $11.25. PB 105923

Results are presented of wind-tunnel tests made at low speed of various small-scale models of sweptback, sweptforward, and yawed wings. The tests covered changes in aspect ratio, taper ratio, and tip shape. Some data were obtained with high-lift devices on sweptback wings and with ailerons on sweptforward wings. The data have been briefly analyzed and some comparisons have been made with the available theory. NACA TN 2445.

X-2 AIRPLANE, SAFETY INSPECTION, by Charles Castellano. U. S. Air Force. Wright Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio.

Sep 1951. 3p Microfilm $1.25, Photostat $1.25. PB 106093

1. X-2 (Airplane) 2. Airplanes - Inspection 3. AAF TSEAA MR 430-173.

XB-52 AIRPLANE, SAFETY INSPECTION, by Daniel T. Murphy. U. S. Air Force. Wright Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Dec 1951. 4p Microfilm $1.25, Photostat $1.25. PB 106092

1. XB-52 (Airplane) 2. Airplanes - Inspection 3. AAF TSEAA MR 426/176.

Instruments

COMPARISON OF PREDICTED AND EXPERIMENTALLY DETERMINED LONGITUDINAL DYNAMIC RESPONSES OF A STABILIZED AIRPLANE, by Louis H. Smaus, Marvin R. Gore and Merle G. Waugh. U. S. National Advisory Committee for Aeronautics. Dec 1951. 55p photos, diagrs, graphs, tables Microfilm $2.75, Photostat $7.50. PB 105822

The dynamic stability in pitch of an aircraft with autopilot was predicted by combining ground measured autopilot transfer functions to obtain open-loop and closed-loop frequency responses and transient responses for the combination. These predicted responses for three airspeeds and for various amounts of displacement and rate-of-displacement feedback are compared with corresponding frequency and transient responses of the stabilized airplane as measured in flight. NACA TN 2578.

DESIGN OF INSTRUMENT DIALS FOR MAXIMUM LEGIBILITY. PART V: ORIGIN LOCATION, SCALE BREAK, NUMBER LOCATION, AND CONTRAST DIRECTION, by William E. Kappauf. U. S. Air Materiel Command. Engineering Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. May 1951. 30p diagrs, graphs, tables Microfilm $2.00, Photostat $3.75. PB 105751

This report deals with an investigation of the effects which origin location, scale break, number location, and contrast direction have upon the speed and accuracy of dial reading. Specific errors which are examined and discussed include reversal errors and errors of plus one numbered scale division. The data are based on a total of 40,400 readings contributed by 46 subjects tested in a group testing situation. Within the limits of design variation studied, the results indicate that the best design for a simple dial which is to be numbered every 10 units and read quantitatively at any and all scale values, is one which has a scale break at zero, locates the zero near the bottom of the dial, and locates the numbers outside the scale. At daytime illumination levels like those used in the present experiment, it makes no difference whether the dial is of black-on-white or white-on-black design. Both the error of plus one numbered division (plus 10 units in the present case) and the reversal error are found to be associated with the reading habit of consulting the scale number which is nearest the pointer. The plus 10 units error is most common in the numerical scale region 0 to 9 no matter where that region appears on the dial. The reversal error is more common in the lower half of clockwise dials where the scale proceeds from right to left than in the upper half where the scale proceeds from left to right. Contract no. W33-038-ac-14480 with Princeton University. AAF TR 6366.

DISCUSSION OF SCALE-READING HABITS, by William E. Kappauf. U. S. Air Development Force. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base Dayton, Ohio. Jul 1951. 54p photos, tables Microfilm $2.75, Photostat $7.50. PB 105963

This report brings together and summarizes various data on scale-reading habits which have been collected in the course of recent Princeton experiments on the design and use of instrument scales. Through an analysis of the conditions under which particular kinds of scale reading errors appear, explanations for these errors are sought in terms of habits and biases of the reader or the nature of the reading task. Evidence observed in scale reading situations, and an inquiry is made into the extent to which these differences may be predicted from simple pencil and paper tests or from previous measures of scale reading performance. Report prepared at Princeton University under Contract no. W33-038-ac-14480. AAF TR 6569.

EFFECT OF POINTER DESIGN AND POINTER ALIGNMENT POSITION ON THE SPEED AND ACCURACY OF READING GROUPS OF SIMULATED ENGINE INSTRUMENTS, by William J. White. U. S. Air Materiel Command. Engineering Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Jul 1951. 20p drawings, graphs, tables Microfilm $1.75, Photostat $2.50. PB 105752

To determine some of the psychological factors which influence the reading of groups of engine instruments, experiments were conducted on the effect of pointer design and pointer alignment position on speed and accuracy of instrument reading. The task of the subject, in the first experiment, was to check read a panel of sixteen simulated engine instruments and indicate alignment or misalignment by a hand-held toggle switch. Five pointer modifications were studied in relation to response time and errors, with special emphasis on the latter. Results of the experiment indicate that modification of the pointer base to the extent employed in the experiment does not accomplish a satisfactory reduction of 180 degree type error. The second experiment required a qualitative reading of the deviation in order to make a correction by selecting the appropriate switch and moving it in the proper direction. All switches were vertically oriented. The 9, 12, 3, and 6 o'clock positions for pointer alignment were evaluated in terms of exposure time as well as response time and error. Alignment at the 9 o'clock position was superior for qualitative reading, both for experienced pilots and pre-flight cadets. The subjects' task in the third experiment was to check read a panel of simulated instruments with pointer alignment at the 9, 12, 3, and 6 o'clock positions and to indicate alignment or misalignment by means of a hand-held toggle switch. Evaluation of the alignment position was in terms of response time and errors. The statistical analysis of these measures did not yield any significant differences. AAF TR 6014.

Engines and Propellers

EFFECTS OF REYNOLDS NUMBER ON THE APPLICATION OF NACA 16-SERIES AIRFOIL CHARACTERISTICS TO PROPELLER DESIGN, by Harold E. Cleary. U. S. National Advisory Committee for Aeronautics. Jan 1952. 15p graphs Microfilm $1.75, Photostat $2.50. PB 105966

An analysis has been made of airfoil data taken on several NACA 16-series propeller airfoils. This analysis has shown that the combined effects of Reynolds number changes and variations in airfoil characteristics resulting from differences in models and tunnels are such that when 5-inch-chord and 12-inch-chord data are applied to full-scale propeller design at or near the design condition, differences of less than 1 percent in efficiency are involved. NACA TN 2591.

GENERAL THEORY OF THREE-DIMENSIONAL FLOW IN SUBSONIC AND SUPERSONIC TURBOMACHINES OF AXIAL-, RADIAL-, AND MIXED FLOW TYPES, by Chung-Hua Wu. U. S. National Advisory Committee for Aeronautics. Jan 1952. 93p diagrs, table Microfilm $4.25, Photostat $12.50. PB 106117

Presents a general theory of steady three-dimensional flow of a nonviscous fluid in turbomachines having arbitrary hub and casing shapes and a finite number of blades. Solution of the three-dimensional direct and inverse problem is obtained by investigating an appropriate combination of two-dimensional flows on relative stream surfaces whose intersections with a z-plane either upstream of or somewhere inside the blade row form a circular arc or a radial line. The theory is applicable to both irrotational and rotational absolute flow at the inlet of the blade row and at both design and off-design operations. NACA TN 2604.

Aerodynamics

APPLICATION OF THE VON KÁRMÁN MOMENTUM THEOREM TO TURBULENT BOUNDARY LAYERS, by Jerold M. Bidwell. U. S. National Advisory Committee for Aeronautics. Dec 1951. 25p graphs Microfilm $2.00, Photostat $3.75. PB 105857

A study is made of the Von Kármán momentum theorem with respect to its application to turbulent boundary layers in a positive pressure gradient. Data were obtained from Schubauer and Klebanoff (NACA TN 2133) and Ludwieg and Tillman (NACA TM 1285) with which both the terms due to the mean flow and the terms due to the fluctuating flow could be evaluated. See also NACA TM 1285(PB 110137) and NACA TN 2133 (PB 101355). NACA TN 2571.

APPROXIMATE METHODS FOR CALCULATING THE FLOW ABOUT NONLIFTING BODIES OF REVOLUTION AT HIGH SUPERSONIC AIRSPEEDS, by A. J. Eggers, Jr. and Raymond C. Savin. U. S. National Advisory Committee for Aeronautics. Dec 1951. 40p diagrs, graphs Microfilm $2.25, Photostat $5.00. PB 105823

Explicit expressions are developed which yield the Mach number and pressure distributions on the surfaces of pointed nonlifting bodies of revolution operating at high supersonic airspeeds and at values of the hypersonic similarity parameter (ratio of free-stream Mach number to slenderness ratio) greater than 1. Very simply explicit expressions are obtained for these distributions in the special case of slender bodies. In the case of cones, the analytic solutions accurately define the entire flow field over a wide range of free-stream Mach numbers and apex angles. NACA TN 2579.

BEHAVIOR OF VORTEX SYSTEM BEHIND CRUCIFORM WINGS: MOTIONS OF FULLY ROLLED-UP VORTICES, by Alvin H. Sacks. U. S. National Advisory Committee for Aeronautics. Jan 1952. 39p photos, diagrs, graphs Microfilm $2.25, Photostat $5.00. PB 106042

The motions of four fully rolled-up vortices representing the vortex system trailing behind cruciform wings (banked 45°) at all Mach numbers are investigated by theoretical and visual-flow methods. Equations are developed for the vortex paths in three dimensions, and the distance behind the wing at which the upper two vortices "leapfrog" through the lower two is calculated. Results of some water-tank tests are presented and comparisons made with the theory. NACA TN 2605.

CRITERIONS FOR CONDENSATION-FREE FLOW IN SUPERSONIC TUNNELS, by Warren C. Burgess, Jr. and Ferris L. Seashore. U. S. National Advisory Committee for Aeronautics. Dec 1951. 38p photos, diagr, drawing, graphs, table Microfilm $2.25, Photostat $5.00. PB 105809

The results of an investigation of water-vapor condensation shocks in the air passing through supersonic tunnels are presented. Criterions for condensation free flow are established by correlating experimental observations with the Volmer theory of nuclei formation. The criterions are presented in a form independent of tunnel-inlet stagnation pressure and are extended theoretically to a Mach number of 4.0. Preliminary evidence of the effect of tunnel size on the criterions is presented. NACA TN 2518.

DIRECT MEASUREMENTS OF SKIN FRICTION, by Satish Dhawan. U. S. National Advisory Committee for Aeronautics. Jan 1952. 60p photos, diagrs, graphs Microfilm $2.75, Photostat $7.50. PB 106040

A device was developed to measure local skin friction on a flat plate by measuring the force exerted on a very small movable part of the flat plate. The apparatus was applied to measurements in the low-speed range, for both laminar and turbulent boundary layers, and the measured skin-friction coefficients show excellent agreement with Blasius' and Von Kármán's results. Measurements were made in high-speed subsonic flow and turbulent-skin-friction coefficients were determined up to a Mach number of about 0.8. A few measurements were also made in supersonic flow. NACA TN 2567.

ESTIMATE OF SLIP EFFECT ON COMPRESSIBLE LAMINAR-BOUNDARY-LAYER SKIN FRICTION, by Harold Mirels. U. S. National Advisory Committee

for Aeronautics. Jan 1952. 22p graphs Microfilm $2.00, Photostat $3.75. PB 106137

A solution to Rayleigh's problem for a compressible fluid, with slip boundary conditions, has been obtained and related to the flow past a semi-infinite flat plate. The results have been interpreted to define the border region between continuum and slip flow and to estimate the effect of slip. NACA TN 2609.

INVESTIGATION OF LAMINAR BOUNDARY LAYER IN COMPRESSIBLE FLUIDS USING THE CROCCO METHOD, by E. R. Van Driest. U. S. National Advisory Committee for Aeronautics. Jan 1952. 78p graphs, tables Microfilm $3.50, Photostat $10.00. PB 106041

The Crocco method has been used to compute the skin-friction and heat-transfer coefficients for high-speed air flow in the laminar boundary layer on a flat plate, assuming a Prandtl number of 0.75 and constant specific heat, and using the Sutherland viscosity law. The results are different from those given by Crocco in that they are based on an ambient temperature of -67.6° F and extend the Mach number range considerably above 5 with variable wall-to-free-stream temperature ratio. Variation of shear, velocity, temperature, and Mach number across the layer are shown. The application of the Crocco method of laminar-boundary-layer analysis is discussed in detail. NACA TN 2597.

METHOD OF DESIGNING CORNER CHANNELS AND CASCADES ON A HYPERBOLIC BASE-LINE, by R.J. Monaghan. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Jan 1946. 10p diagrs, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.75. PB 106013

1. Hyperbolic functions - Gt. Brit. 2. Cascades (Aerodynamics) - Design - Gt. Brit. 3. Wind tunnels, Two dimensional - Design - Gt. Brit. 4. ARC RM 2464.

Cover date is 1951. S. O. code no. 23-2464.

NEW METHOD OF NUMERICAL INTEGRATION OF THE EQUATIONS OF THE LAMINAR BOUNDARY LAYER, by T. G. Cowling. Communicated by Professor D. R. Hartree. Gt. Brit. Ministry of Supply. Aeronautical Research Council. May 1945. 14p graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 106014

A new method for the numerical solution of the boundary-layer equations is described. This rests in essence on the fact that the equations of steady flow are special cases of the equations of general motion. The velocity profiles are found at successive sections across the boundary layer. Trial values of the velocity are assumed at any section; from these, space derivatives of the velocity are deduced by using finite differences, and time derivatives by using the equations of motion. The trial values are then adjusted to give zero time derivatives of the velocity at the section. The method in some respects resembles Southwell's relaxation method. The method has been applied to two problems already discussed numerically by Hartree. It is not suitable for use with a differential analyser, though the development of new calculating machines may bring it within the range of machine integration; but rather less labour was required to achieve manually with it results rather more accurate than obtained by Hartree with the differential analyser. The results did not, however, differ greatly from Hartree's. Cover date is 1951. S. O. Code no. 23-2575. ARC RM 2575.

NOTE ON THE EFFECT OF BOUNDARY LAYER SUCTION ON SEPARATION, by E. J. Watson. Gt. Brit. Ministry of Supply. Aeronautical Research Council. May 1947. 2p diagrs Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $.25. PB 105679

1. Boundary layer - Theory - Gt. Brit. 2. ARC RM 2538.

S. O. Code no. 23-2538. Cover date is 1951.

NOTES ON THE DESIGN OF CONVERGING CHANNELS, by S. Goldstein. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Mar 1945. 14p diagrs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.00. PB 105338

The design of two-dimensional converging channels is considered, with special reference to (i) the lenghts of the channels and (ii) the occurrence or absence of unfavourable velocity gradients at the walls. It is shown that it is not possible to have a short channel unless the velocity at the wall decreases at the beginning (the upstream end) of the channel; and it is further shown how a series of channels may be designed of decreasing lengths with increasingly unfavourable velocity gradients at the walls. Cover date is 1951. S. O. Code no. 23-2643. ARC RM 2643.

ODPOR PODÉLNE OBTÉKANÉ DESKY PRI MALÝCH REYNOLDSOVÝCH CÍSLECH (RESISTANCE OF A PLATE IN PARALLEL FLOW AT LOW REYNOLDS NUMBERS), by Zbynek Janour. Nov 1951. 40p diagrs, graphs, tables Microfilm $2.25, Photostat $5.00. PB 105817

The present paper gives the results of measurements of the resistance of a plate placed parallel to the flow in the range of Reynolds numbers from 10 to 2300; in this range the resistance deviates from the formula of Blasius. The lower limit of validity of the Blasius formula is determined and also the increase in resistance at the edges parallel to the flow in the case of a plate of finite width. Translated from Letecký Vyzkumný Ústav, Praha, Rep. 2, 1947. NACA TM 1316.

ON THE ATTACHED CURVED SHOCK IN FRONT OF A SHARP-NOSED AXIALLY SYMMETRICAL BODY PLACED IN A UNIFORM STREAM, by S. F. Shen and C. C. Lin. U. S. National Advisory Committee for Aeronautics. Oct 1951. 66p diagrs, graphs, tables Microfilm $3.00, Photostat $8.75. PB 105475

The flow behind the attached curved shock near the nose of an axially symmetrical body placed in a uniform stream is investigated by perturbation from the Taylor-Maccoll conical solution. The first-order perturbation yields the ratio of the initial radii of curvature of the shock and the body. Numerical re-

sults are presented for initial semivertex angles of 10°, 20°, and 30°, up to a Mach number around 5. A negative ratio of curvatures is again obtained at low Mach number, as in the two-dimensional case. Higher-order perturbations indicate that a regular shock shape might lead to a logarithmic singularity at the nose of the body. NACA TN 2505.

ON THE SPECTRUM OF ISOTROPIC TURBULENCE, by H. W. Liepmann, J. Laufer and Kate Liepmann. U. S. National Advisory Committee for Aeronautics. Nov 1951. 61p drawings, graphs Microfilm $3.00, Photostat $8.75. PB 105536

Measurements of the spectrum and correlation functions at large Reynolds numbers were made, as well as a series of accurate spectrum measurements at lower Reynolds numbers, and the results are compared with theory. The second, fourth, and sixth moments of the spectrum were computed from the measurements and are discussed in relation to theoretical results. The significance of the number of zeros of the fluctuating velocity components was investigated and examples of measurements for the determination of the microscale of turbulence from zero counts are presented. NACA TN 2473.

ORIENTATION OF ORIFICES ON BODIES OF REVOLUTION FOR DETERMINATION OF STREAM STATIC PRESSURE AT SUPERSONIC SPEEDS, by Morton Cooper and Clyde V. Hamilton. U. S. National Advisory Committee for Aeronautics. Jan 1952. 26p photo, diagr, table Microfilm $2.00, Photostat $3.75. PB 105967

Experimental pressures obtained on a parabolic body of revolution of large fineness ratio at a Mach number of 1.59 and a Reynolds number of 3.6×10^6 have been analyzed in order to locate positions at which static-pressure orifices will indicate the stream static pressure independent of the pitch-yaw attitude of the body. NACA TN 2592.

SPECTRUM OF TURBULENCE IN A CONTRACTING STREAM, by H. S. Ribner and M. Tucker. U. S. National Advisory Committee for Aeronautics. Jan 1952. 54p diagrs, graphs Microfilm $2.75, Photostat $7.50. PB 106118

Spectrum concepts are employed to study the selective effect of a stream contraction on longitudinal and lateral turbulent velocity fluctuations. By consideration of the effect of stream contraction on a single plane wave, the effect on spectrum and correlation tensors of the turbulence is determined. Weak turbulence and an inviscid fluid are postulated; compressibility of mean flow only is taken into account. For axisymmetric contraction and isotropic initial turbulence, explicit results are obtained. The one dimensional longitudinal spectrum is found to be markedly distorted. The selective effect of contraction on longitudinal and lateral components of turbulence is found to be given uniquely, regardless of details of the isotropic spectrum; comparison with experiment is made. NACA TN 2606.

STUDIES OF VON KÁRMÁN'S SIMILARITY THEORY AND ITS EXTENSION TO COMPRESSIBLE FLOWS. A CRITICAL EXAMINATION OF SIMILARITY THEORY FOR INCOMPRESSIBLE FLOWS, by C. C. Lin and S. F. Shen. U. S. National Advisory Committee for Aeronautics. Nov 1951. 24p Microfilm $2.00, Photostat $3.75. PB 105683

Von Kármán's similarity theory for incompressible flows is examined critically by using modern concepts in order to provide a basis for extending the theory to compressible flows. It is found that the original form of the theory is supported by modern concepts. NACA TN 2541.

STUDIES OF VON KÁRMÁN'S SIMILARITY THEORY AND ITS EXTENSION TO COMPRESSIBLE FLOWS: A SIMILARITY THEORY FOR TURBULENT BOUNDARY LAYER OVER A FLAT PLATE IN COMPRESSIBLE FLOW, by C. C. Lin and S. F. Shen. U. S. National Advisory Committee for Aeronautics. Nov 1951. 38p Microfilm $2.25, Photostat $5.00. PB 105753

As an application of the concepts in NACA TN 2541, the problem of turbulent boundary layer over a flat plate in compressible flow is treated. The dissipation term in the energy equation, usually neglected, is first studied and found to be of importance. In the differential equations governing the fluctuations, the lower-frequency components of all quantities are regarded to participate in an equilibrium in accordance with similarity. After proper linearization, a set of differential equations containing only the lower order frequency fluctuations is obtained. In parallel with Von Kármán's theory in incompressible flow, similarity scales for all the flow variables are derived. Two possible length scales are found and the significance of this possibility is discussed. NACA TN 2542.

STUDIES OF VON KÁRMÁN'S SIMILARITY THEORY AND ITS EXTENSION TO COMPRESSIBLE FLOWS. INVESTIGATION OF TURBULENT BOUNDARY LAYER OVER A FLAT PLATE IN COMPRESSIBLE FLOW BY THE SIMILARITY THEORY, by S. F. Shen, Massachusetts Institute of Technology. U. S. National Advisory Committee for Aeronautics. Nov 1951. 43p graph Microfilm $2.50, Photostat $6.25. PB 105801

The turbulent-boundary-layer flow over a flat plate in compressible flow is considered on the basis of the scheme established in NACA TN 2542. It is shown how the influence of the Mach number (e.g., on the velocity and temperature distribution) can be predicted from the theory after the constant coefficients in the theory are determined by one set of experimental measurements. NACA TN 2543.

TURBULENCE CHANGES IN CONTRACTING AND DISTORTED PASSAGES, by D. C. MacPhail. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Mar 1944. 19p diagrs, graphs, drawings Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.25. PB 105217

1. Wind tunnels - Contraction - Gt. Brit. 2. Wind tunnels - Turbulence - Gt. Brit. 3. Flow, Turbulent - Gt. Brit. 4. ARC RM 2437.

Cover date is 1951. S. O. Code no. 23-2437.

UNTERSUCHUNGEN AN GEPFEILTEN UND UNGEPFEILTEN FLÜGELN BEI HOHEN UNTERSCHALLGESCHWINDIGKEITEN (INVESTIGATIONS ON WINGS WITH AND WITHOUT SWEEPBACK AT HIGH SUBSONIC SPEEDS), by Jakob Ackeret and others. Nov 1951. 14p photos, graphs Microfilm $1.75, Photostat $2.50. PB 105576

Drag tests at zero lift have been made at Mach numbers from 0.7 to approximately 0.95 in the high speed wind tunnel of the Institute for Aerodynamics, ETH, Zürich, on a group of untapered wings of aspect ratio 3.25, having sweep angles of 0° and 35°. For each sweep angle, a series of geometrically similar models was tested at a constant Reynolds number to provide a verification of computed tunnel blocking corrections. Tests were also made for wings having thickness ratios of 0.09 and 0.12 and the results compared with results predicted by von Kármán's similarity law. Translation from Zeitschrift für angewandte Mathematik und Physik, v. 1, 1950, p. 32-42. NACA TM 1320.

Land Transporation

INVESTIGATION OF CARRIAGE AND WAGON BUILDERS WORKS IN AMERICAN AND BRITISH ZONES OF GERMANY. OCT 10-NOV 23, 1945. British Intelligence Objectives Sub-Committee. Nov 1945. 8f Microfilm $1.25, Enlargement Print $2.50. PB 105655

1. Carriages - Manufacture - Germany 2. Wagons - Manufacture - Germany 3. Cars, Railroad - Germany 4. Railroads - Rolling stock - Costs - Germany 5. Maschinenfabrik Augsburg-Nürnberg A. G., Nürnberg, Ger. 6. Maschinenfabrik Esslingen, Stuttgart, Ger. 7. Wegmann & Cie, Kassel, Ger. 8. Crede, Gebrüder, Niederzwaren, Ger. 9. Maschinenbau und Bahnbedarf, Bochum, Ger. 10. Düsseldorfer Waggonfabrik, Düsseldorf, Ger. 11. Waggonfabrik Uerdingen A. G., Uerdingen, Ger. 12. Vereinigte Westdeutsche Waggonfabriken A. G., Cologne, Ger. 13. Waggonfabrik Talbot G.m.b.H., Aachen, Ger. 14. BIOS FR 1127. 15. Micro BIOS FD 3091/48, Frames 1-8.

Includes Standard costs of German rolling stock ruling in 1939.

Marine Transportation

TMB AUTOMATIC SHIP'S MOTION RECORDER, by Norman H. Jasper. U. S. David W. Taylor Model Basin, Washington, D. C. Oct 1951. 29p photos, diagrs (1 fold) tables Microfilm $2.00, Photostat $3.75. PB 105853

This report describes the development of an automatic ship's motion recorder which records the ship's rolling, pitching, and heaving accelerations as well as the rolling and pitching angles. The recorder has provision for automatic sampling of data at preselected intervals of time, and it can operate continuously for weeks on shipboard without requiring human attention. The apparatus may also be used to record quantities other than those mentioned, for example, pressures and strains. The recorder and the transducers are evaluated on the basis of their performance so far, and further worthwhile developments are suggested in the report. NS731-037. DWTMB 777.

ÜBER DEN SCHIFFWIDERSTAND AUF BESCHRÄNKTEN WASSER (RESISTANCE OF SHIPS IN CONFINED WATERS), by J. Kreitner. Translated by F. Rizzo. Sep 1950. 21p diagr, graphs, table Microfilm $2.00, Photostat $3.75. PB 105838

1. Ships - Hydrodynamics - Germany 2. Hydrography - Germany 3. NAVSHIPS T389.

Reprint from Werft reederei hafen, hft. 7, 1934.

MISCELLANEOUS

THE DETECTABILITY OF YELLOWS, YELLOW-REDS, AND REDS IN AIR-SEA RESCUE, by Florence L. Malone, Mary S. Sexton and Dean Farnsworth. U. S. Navy. Medical Research Laboratory, Naval Submarine Base, New London, Con. Sep 1951. 17p photo, col. diagrs, graphs, tables Microfilm $1.75, Photostat $2.50. PB 105945

The effectiveness of the yellow currently used for lifesaving equipment as compared with a graduated series of yellows, yellow-reds, and reds (from 7.5 YR 7/8 to 5 R 7/8) was investigated. The experiment also investigated the use of a pair of chlorophyll detection goggles (1635 1/2 Eastman Kodak Company) as a means of increasing the visibility of the colors in this range. Observations were made out-doors in sunlight at distances of fifty to one hundred and thirty feet from the targets. The test colors were 1/4" circles mounted on blue-grey boards representing the color of the sea under three different weather conditions. The results indicate that the current yellow is a poor choice for lifesaving equipment, that orange-reds of the same brightness are more visible, and that the use of the 1635 1/2 detection goggle does not increase the visibility of the colors tested. Color Vision Report no. 25. Medical Research Laboratory Publications Volume 10, 1951, p. 177-185. NAV MRL 182. NMRI Proj. NM 003 041.35.01.

HOSE ASSEMBLIES, LOW PRESSURE (FOR BREATHING OXYGEN) FLEX-O-TUBE COMPANY, PART NO. HA-9074. AMENDMENT NO. 1, by John P. O'Brien. U. S. Air Force. Wright Air Development Center, Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1951. 2p Microfilm $1.25, Photostat $1.25. PB 106096

1. Hose, Low pressure oxygen 2. Flex-O-Tube Company, Detroit, Mich. 3. AAF TSEAA MR 660-109-E-1 amendment no. 1.

HOSE ASSEMBLIES FOR BREATHING OXYGEN, by B. McWhirter. U. S. Air Materiel Command. Engineering Division. Materials Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1951. 4p table Microfilm $1.25, Photostat $1.25. PB 106106

1. Oxygen equipment - Tests 2. Hose, Low pressure oxygen - Tests 3. Anchor Coupling Co., Detroit, Mich. 4. AAF TSEAM T E51-31.

HOSE ASSEMBLY, LOW PRESSURE (FOR BREATHING OXYGEN) AMENDMENT NO. 1, by

John P. O'Brien. U. S. Air Force. Wright Air Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Nov 1951. 2p Microfilm $1.25, Photostat $1.25. PB 106097

1. Hose, Low pressure oxygen 2. Electric Hose and Rubber Co. 3. AAF TSEAA MR 660-109-M amendment no. 1.

LAND USE PROBLEMS AND POLICIES IN JAPAN; by V. Webster Johnson. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 74p diagr Microfilm $3.50, Photostat $10.00. PB 106120

1. Land utilization - Japan 2. Land tenure - Japan 3. SCAP NRS PS 69.

NEW FIELD RESUSCITATOR, by Richard J. Johns and David Y. Cooper. U. S. Chemical Corps. Medical Laboratories, Army Chemical Center, Maryland. Aug 1951. 13p photos, graph Microfilm $1.75, Photostat $2.50. PB 105988

An apparatus has been devised which, when used with standard M-9 gas masks, will allow intermittent positive pressure or alternate positive and negative pressure artificial respiration. The apparatus operates on a modification of the mouth-to-mouth principle and can be safely used in a contaminated atmosphere. CMLEM-52. Project no.: 4-59-12-07. CC MD RR 76.

OXYGEN-MASK LEAKAGE KIT, TYPE AN-K-4, CONTRACT NO. AF 33(038)17356, by Raymond H. Middleton. U. S. Air Force. Wright Air Development Center, Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Aug 1951. 3p drawing Microfilm $1.25, Photostat $1.25. PB 106102

1. AN-K-4 (Oxygen mask leakage kit) 2. Respirators, Oxygen generating - Maintenance and repair 3. Kits, Oxygen leakage 4. AAF TSEAA MR 696-108-G.

PARACHUTE DESIGN, by T. F. Johns. Gt. Brit. Ministry of Supply. Aeronautical Research Council. Dec 1946. 33p fold drawings, graphs, tables Available from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. $1.90. PB 105772

This report records the methods of parachute design which have been developed in this country during the latter part of the war. It begins with a discussion of the main characteristics of a parachute and of the effects of various factors on these characteristics. It then describes the main types of parachute which are at present in use and discusses the merits of each type. Detailed are given of the methods of manufacture which have been found to be the most satisfactory. It is then shown how this information is used in the design of parachute should be used to meet specific requirements. It is shown that parachutes may be divided broadly into two classes, those which open at approximately their release speed and those which slow down their load appreciably before becoming fully inflated. The design technique in the two cases is quite different, and they are therefore treated separately. It is shown that if parachutes are to be mass-produced, serious modifications have to be made to the design technique because of the variation of porosity which occurs when fabric is made in large quantities. An indication is given of the degree of accuracy which can be expected from the methods described, and possible refinements to the design technique are suggested for use when more accurate data are available regarding the performance of parachutes.. No attempt is made to deal with unconventional designs or with clusters of parachutes. The limitations of the methods of design are discussed, and finally some suggestions are made for future research. S. O. Code no. 23-2402. Cover date is 1951. ARC RM 2402.

RECONNAISSANCE SOIL SURVEY OF JAPAN, SUMMARY, by Thomas E. Ritchie. Supreme Commander for the Allied Powers. Natural Resources Section. Dec 1951. 113p photos, maps (part fold), (part col.) tables Microfilm $4.75, Photostat $15.00 PB 106121

1. Soil surveys - Japan 2. SCAP NRS 110-I.

RIVER CONTROL AND UTILIZATION IN JAPAN, by Robert Y. Grant. Supreme Commander for the Allied Powers. Natural Resources Section. Nov 1951. 165p photos, maps (part fold) graphs, tables Microfilm $6.25, Photostat $21.25. PB 105933

1. Rivers - Japan 2. Rivers - Pollution - Japan 3. Water supply - Japan 4. Floods - Japan 4. Floods - Japan 5. Dams - Construction - Japan 6. Hydroelectric power - Japan 7. Irrigation - Japan 8. SCAP NRS 149.

SERVICE TESTS CONDUCTED 3 JULY 1951 ON PNEUMATIC SEA-SURVIVAL EQUIPMENT, by Wayne B. Yarcho. U. S. Air Force. Wright Air Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Aug 1951. 20p photos, table Microfilm $1.75, Photostat $2.50. PB 106105

1. Survival equipment - Tests 2. AAF TSEAA MR 670-2S.

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1. Animals, Aquatic - Japan 2. Plants, Aquatic - Japan 3. SCAP NRS 151.

Japanese, Chinese, scientific and English names included.

TO EVALUATE THE PHYSIOLOGICAL ADEQUACY OF A NEW-TYPE REBREATHER BAG FOR THE A-8B OXYGEN MASK, by William W. Pryor, Gerald Marks, and Raymond H. Middleton. U. S. Air Force. Wright Air Development Center. Research Division. Aero-Medical Laboratory, Wright-Patterson Air Force Base, Dayton, Ohio. Aug 1951. 8p graph, table Microfilm $1.25, Photostat $1.25. PB 106101

1. A-8B (Oxygen mask) 2. Oxygen equipment 3. Oxygen rebreathers 4. Bags, Oxygen 5. AAF TSEAA MR 696-107L.

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